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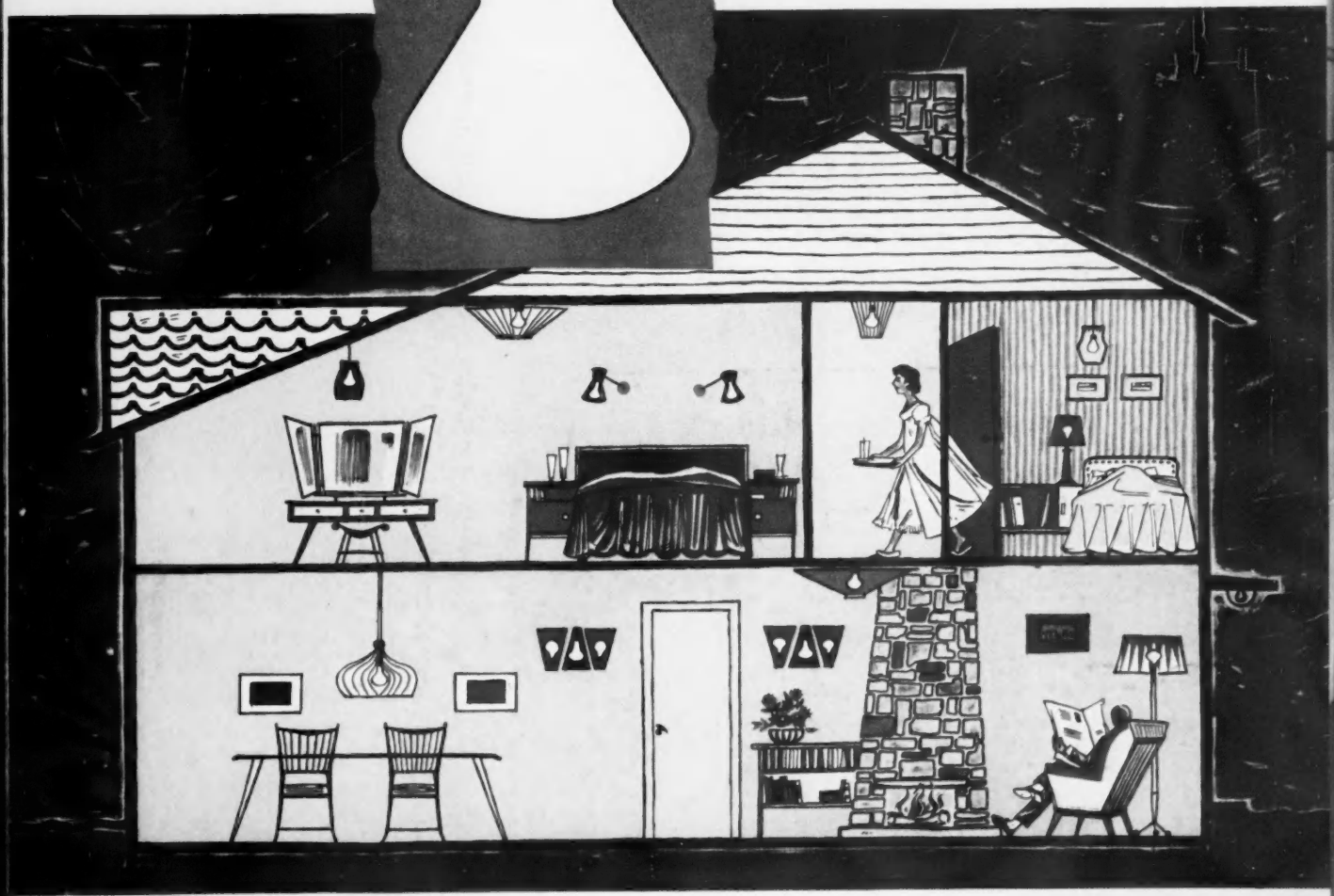

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STAND No. 37
BRITISH RAILWAYS ELECTRIFICATION CONFERENCE & EXHIBITION 1960
October 3—9

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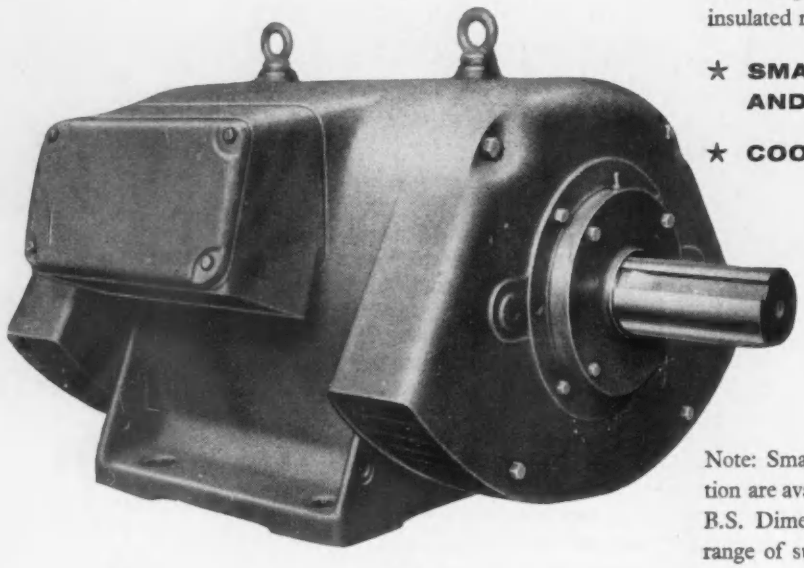

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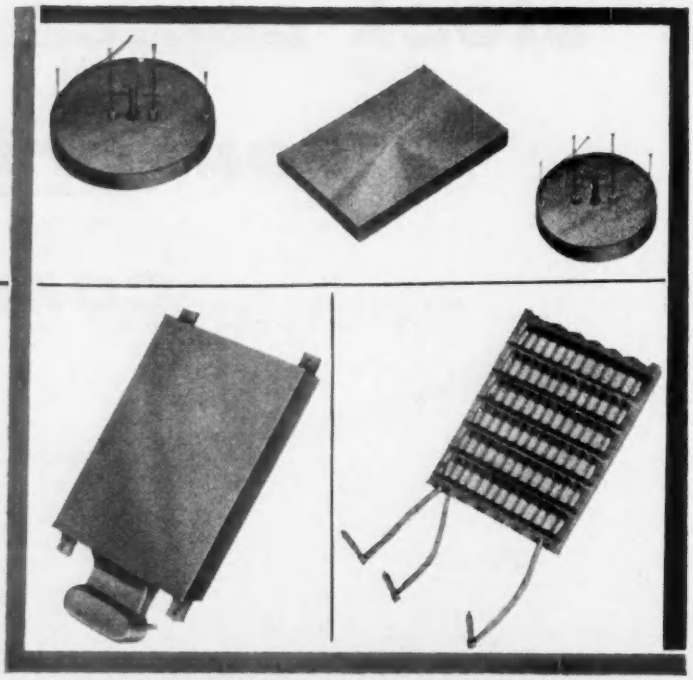

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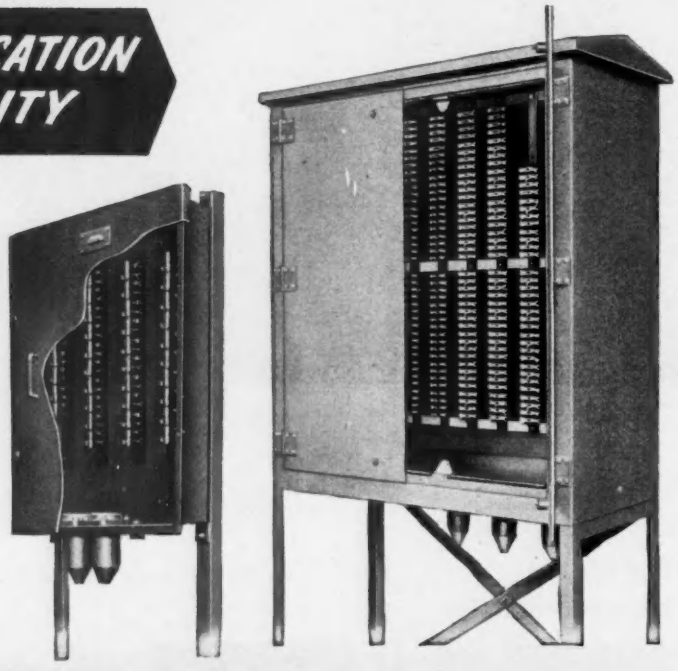

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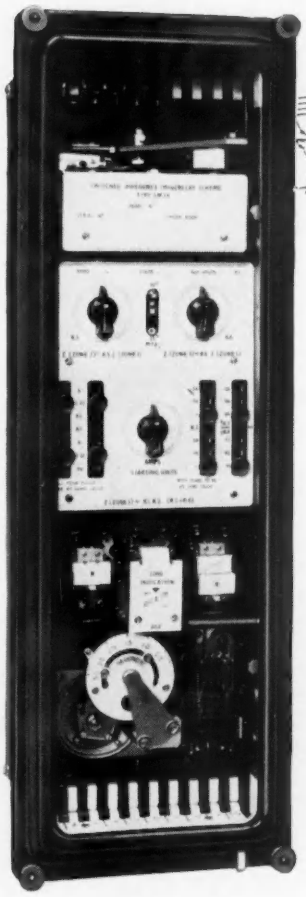

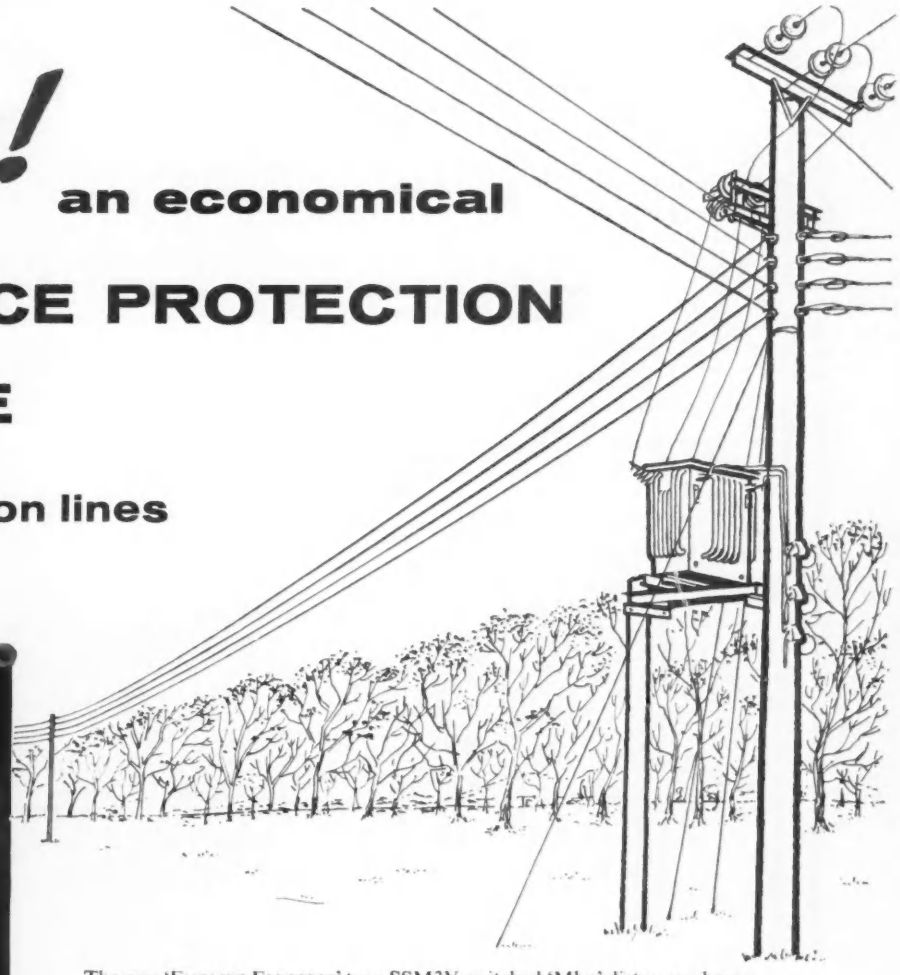

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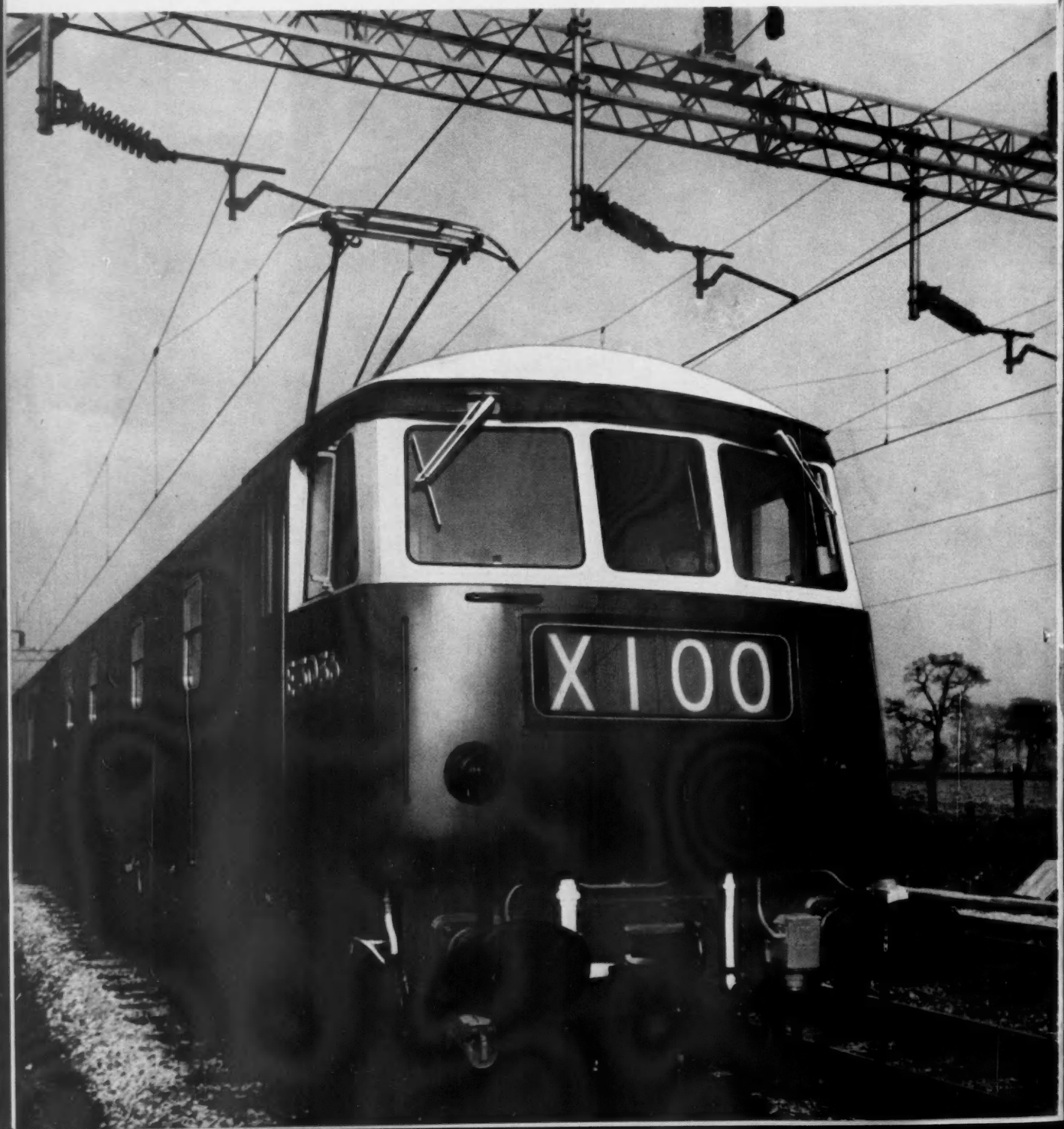

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to the 25 kV a.c. electrification scheme of British Railways is an impressive one. Further G.E.C. contributions to the modernisation of British Railways include electrical equipment for:
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SEVENTY ONE multiple unit stock equipments for three and four-car units

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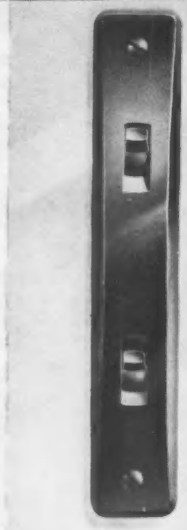
ARCHITRAVE SWITCH ASSEMBLY



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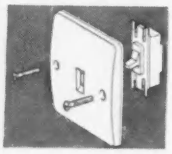

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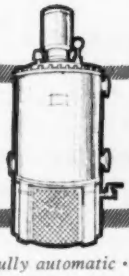

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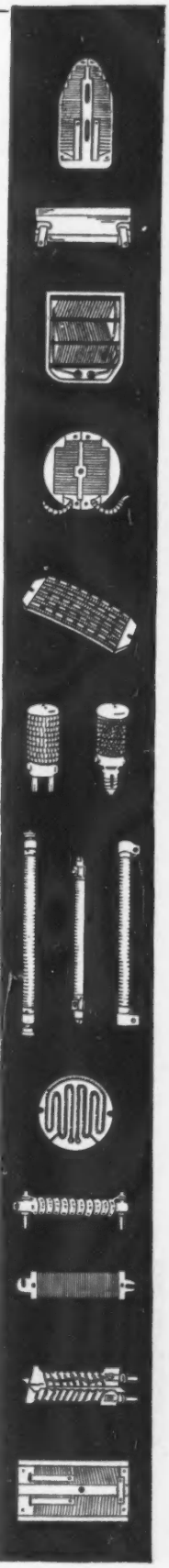

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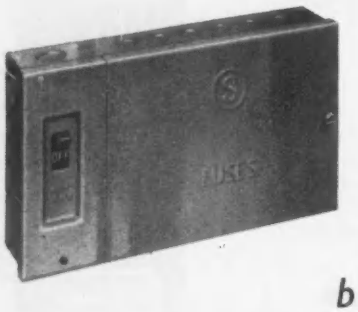

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NEWS SHEET

Annual reports of supply industry show sales of electricity 9·8% up at 85,719m. kWh, with 2·1% increase in number of consumers. Average price 1·506d/kWh, fall of 0·048d/kWh. M.D. 23,089 MW. Off-peak sales up 30%. Combined surplus of industry's trading £26·7m., slightly down, on increased turnover of £552·5m. Surplus from contracting and sales of fittings sharply up at £6·6m. Capital expenditure reached £317·8m.; drop in self-financing from 47·4% to 43·6%. Thermal efficiency of generation improves 0·43% to 26·53%. 9·1% increase in aggregate plant. Grid lines extend by 10·8%. Employees up only 0·8%. (465, 467)

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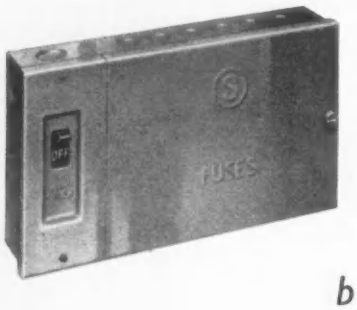

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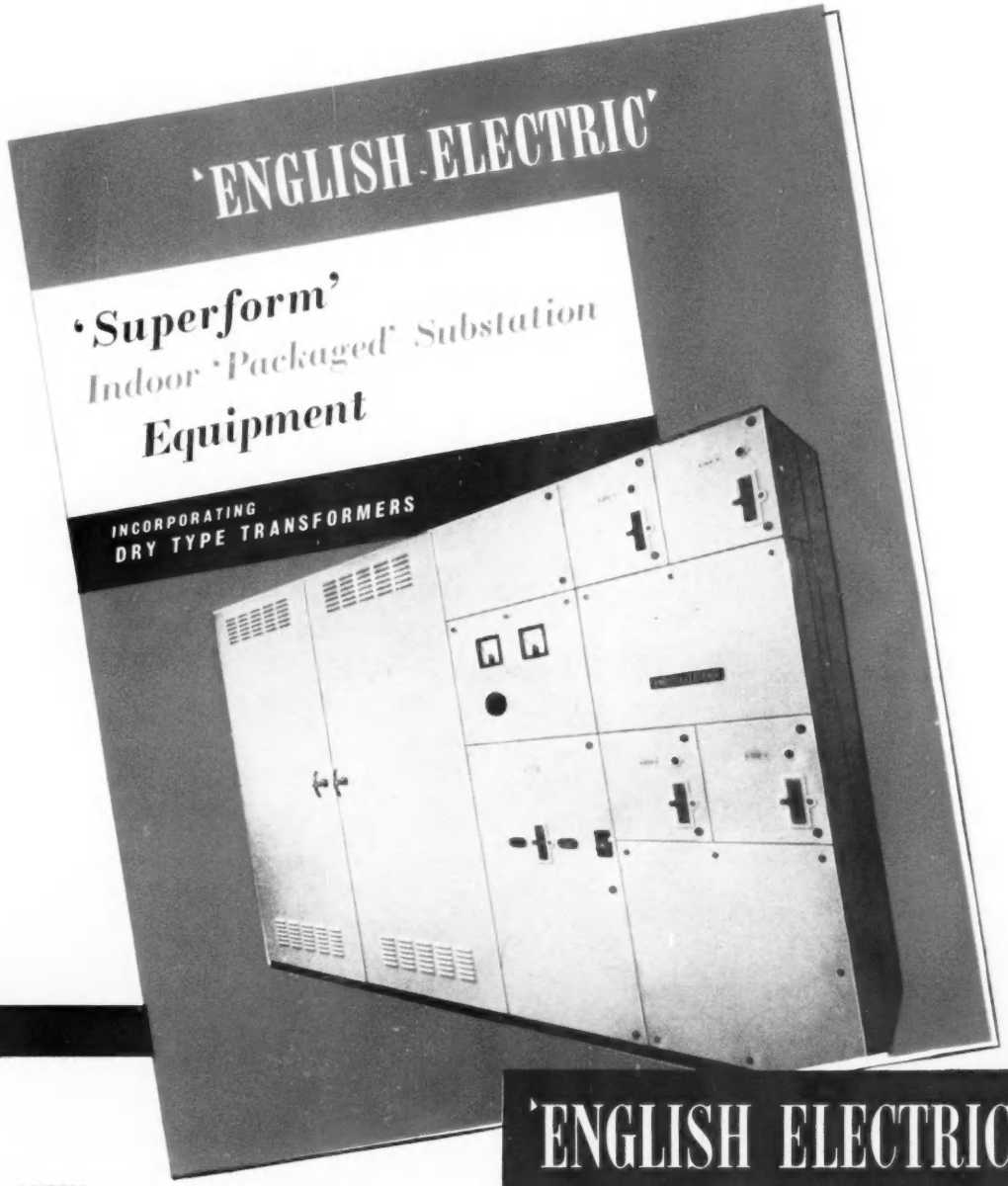
what is a 'Packaged' Substation ?



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FG. 52

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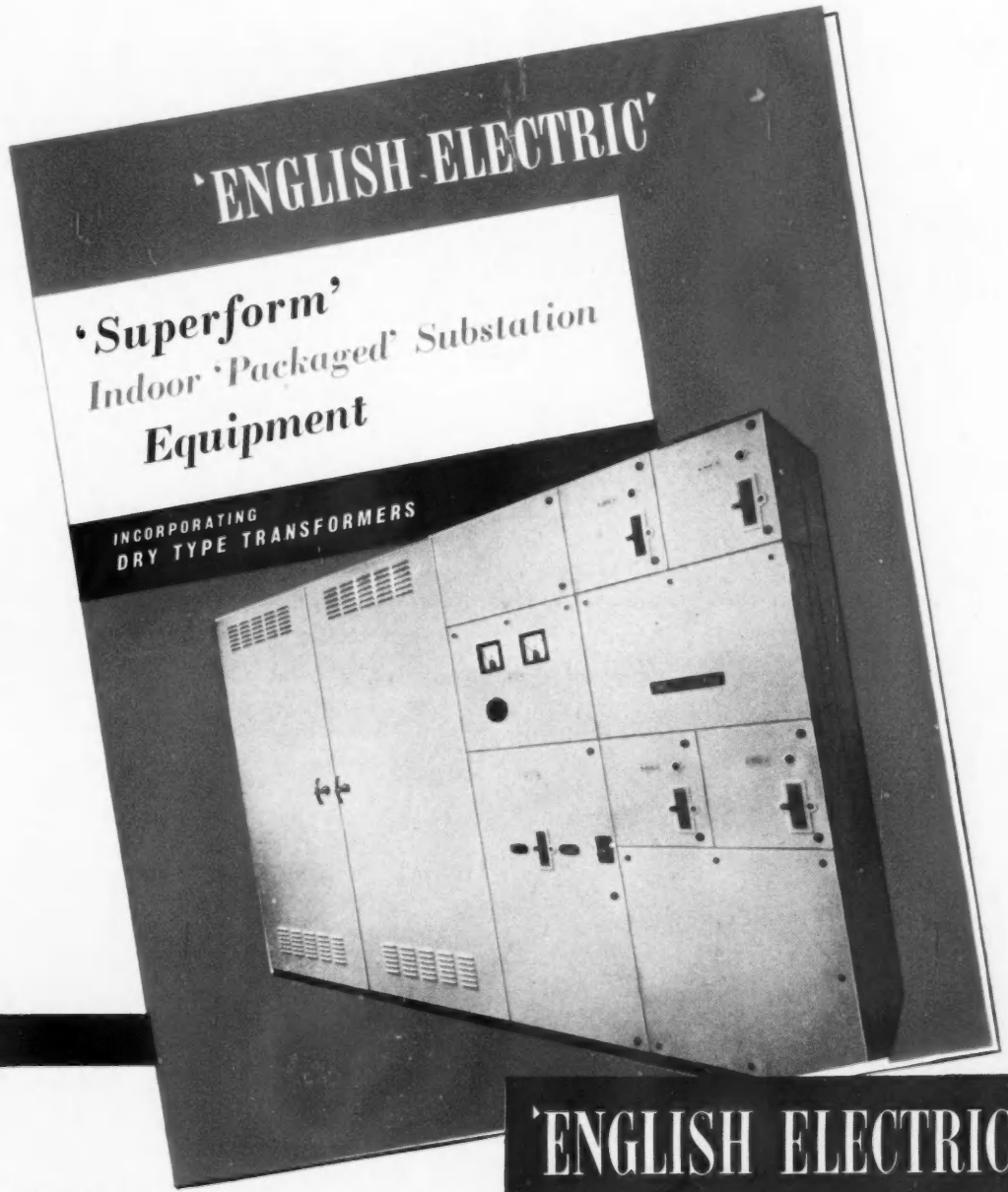

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FG. 52

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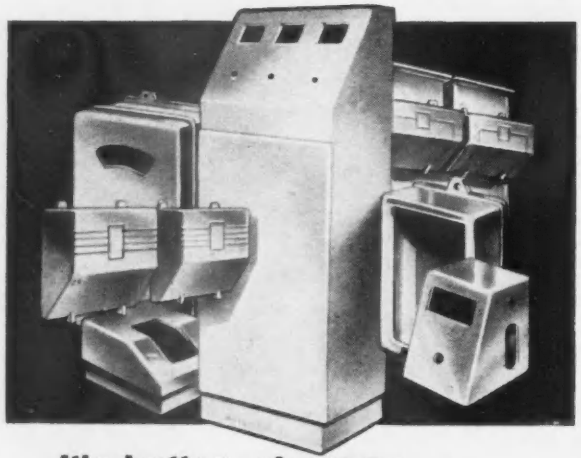

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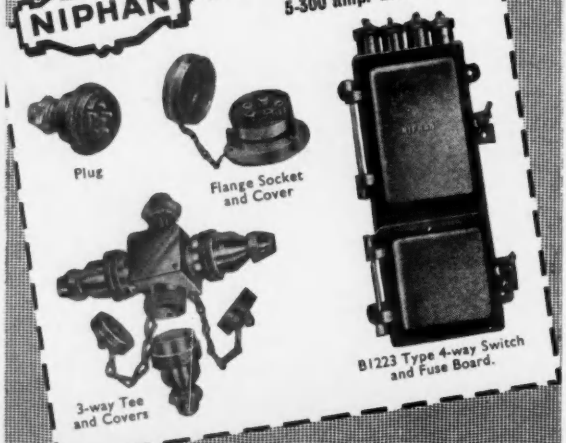

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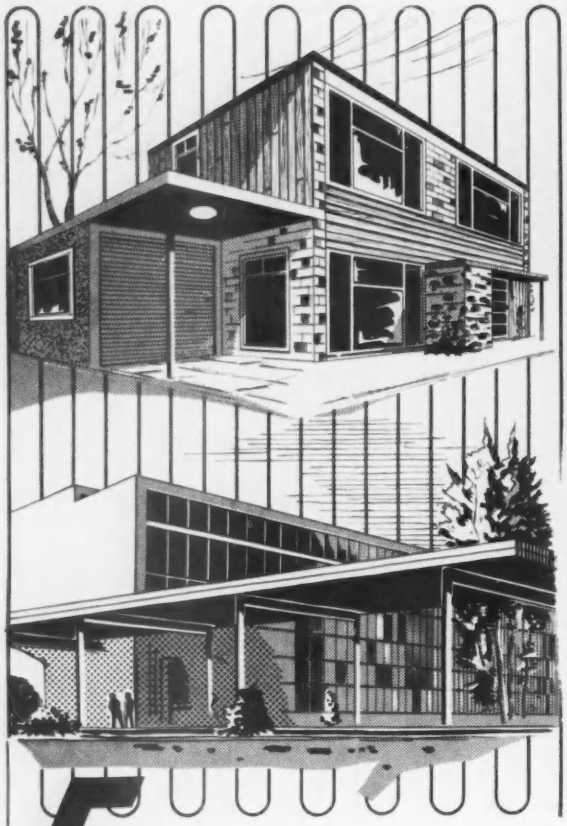

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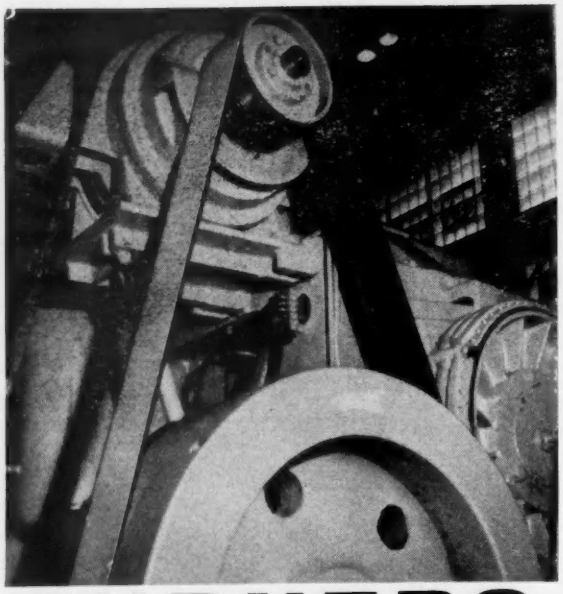

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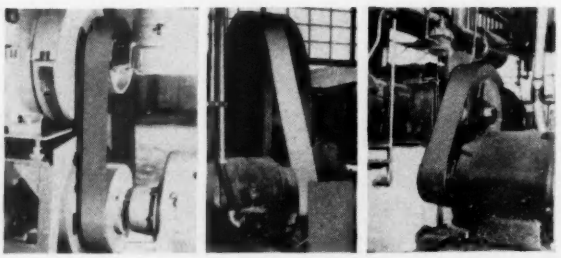

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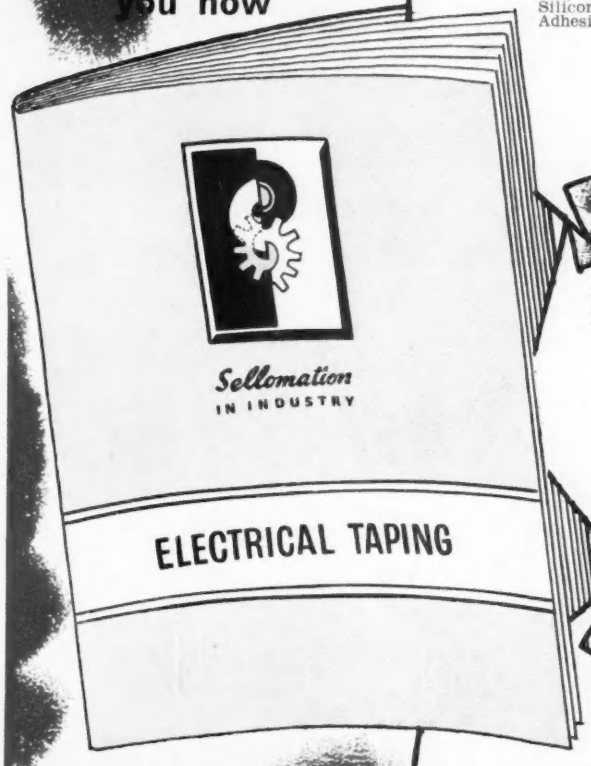

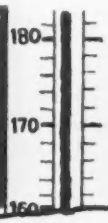

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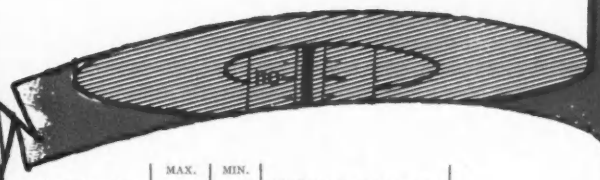

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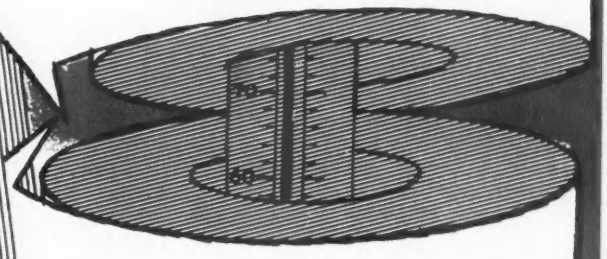

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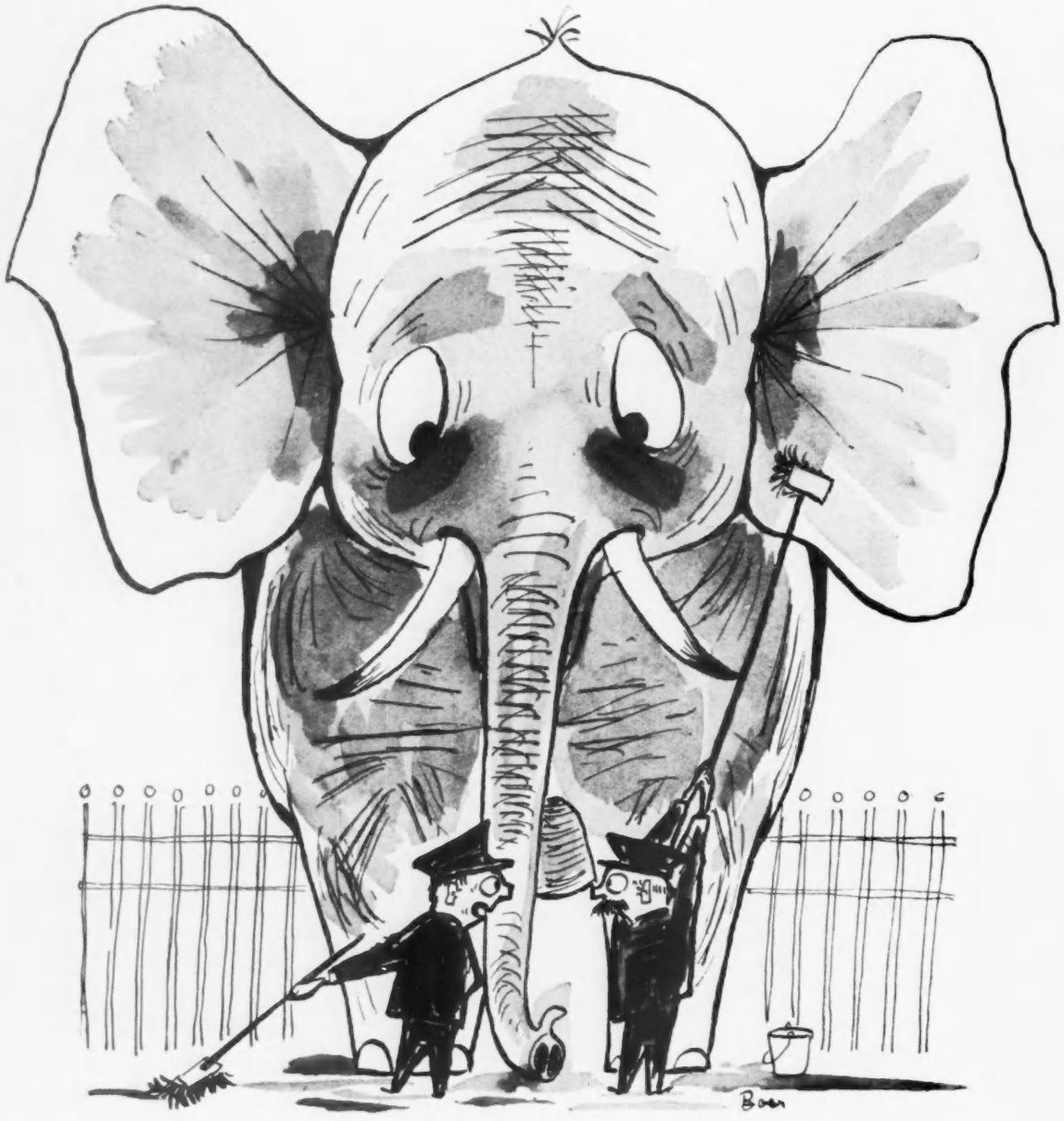

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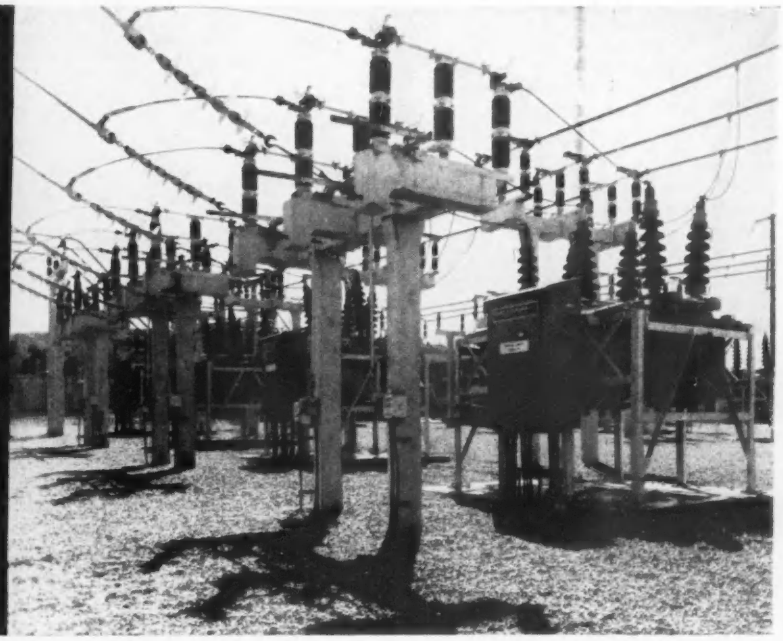

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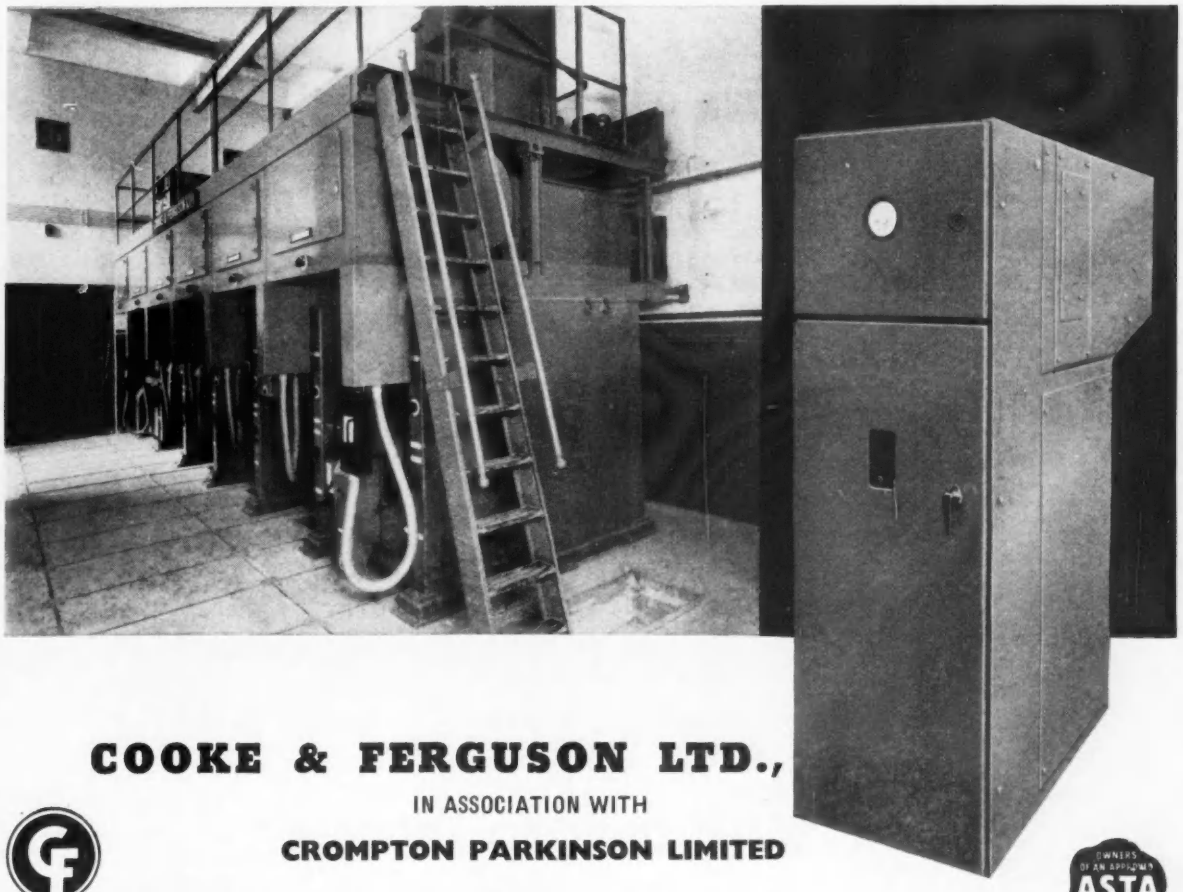

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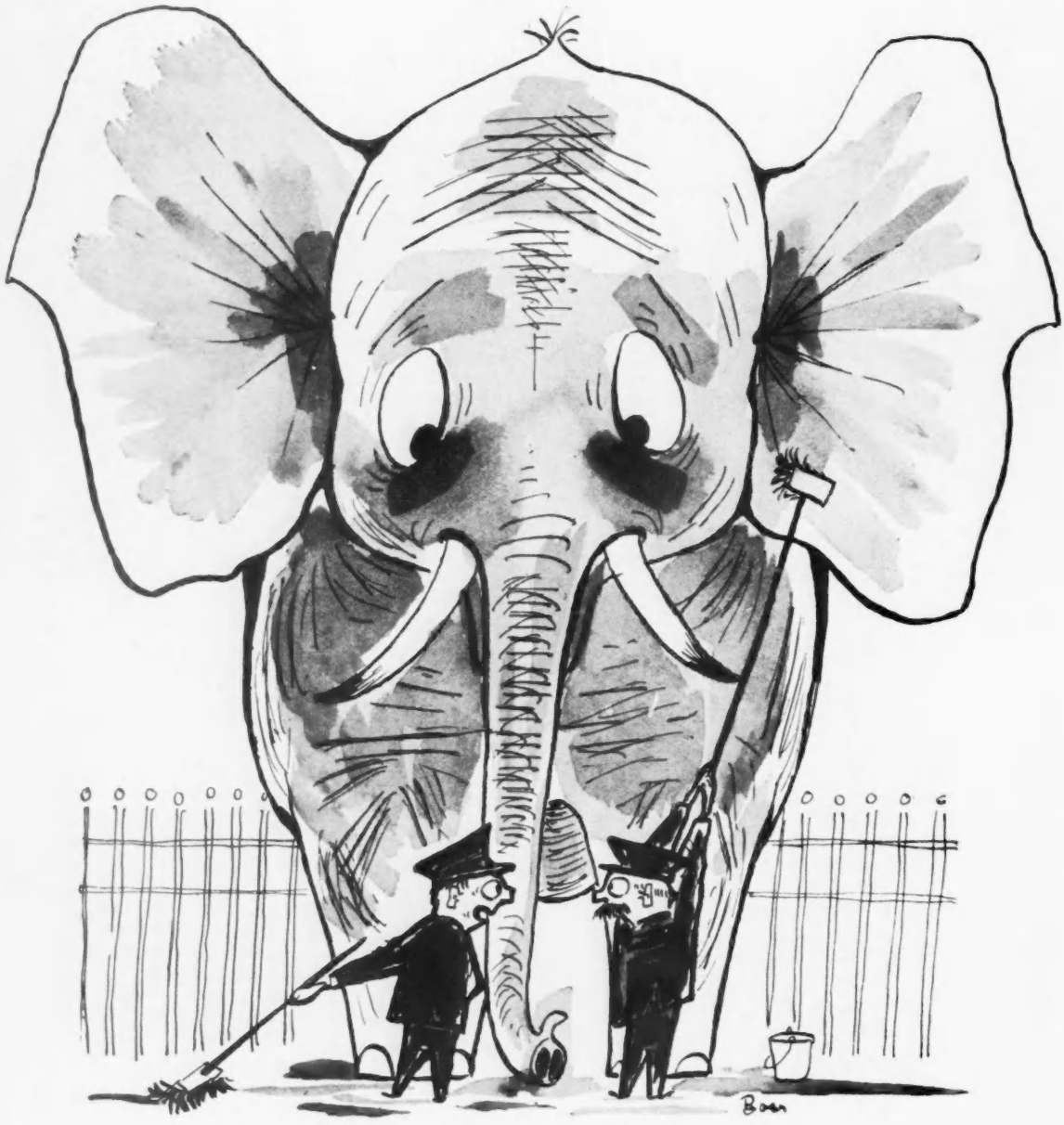

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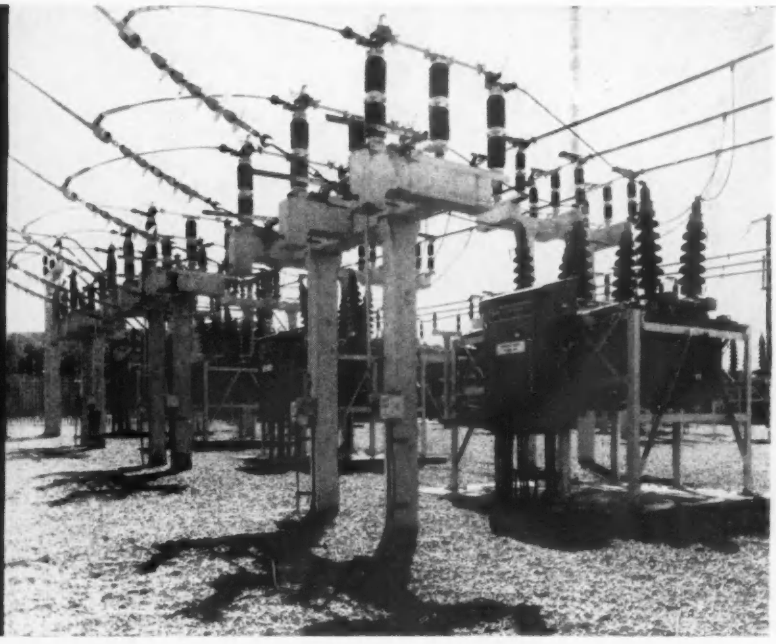

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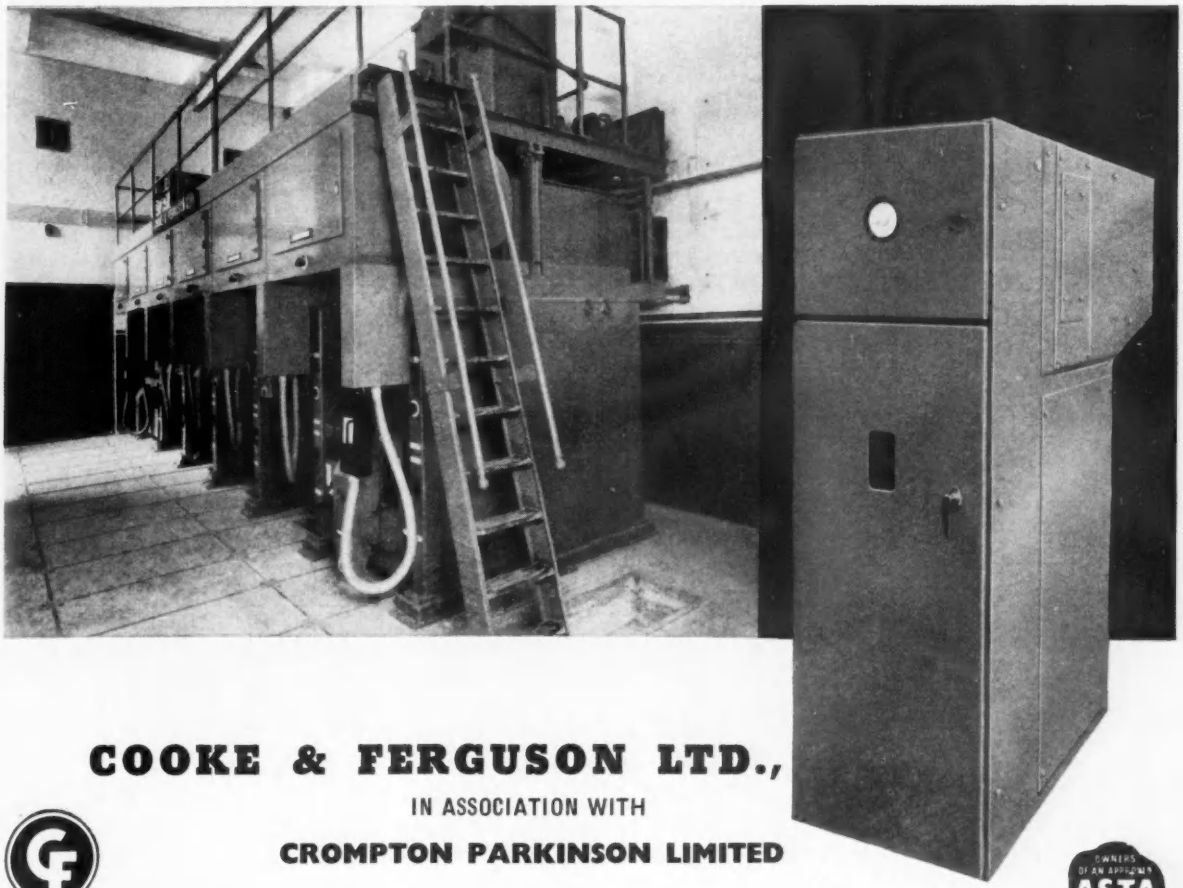

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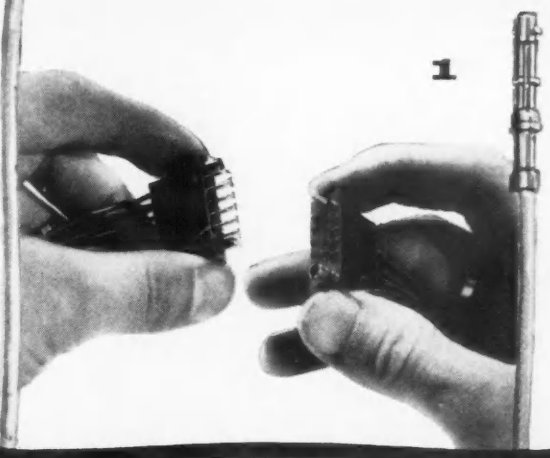

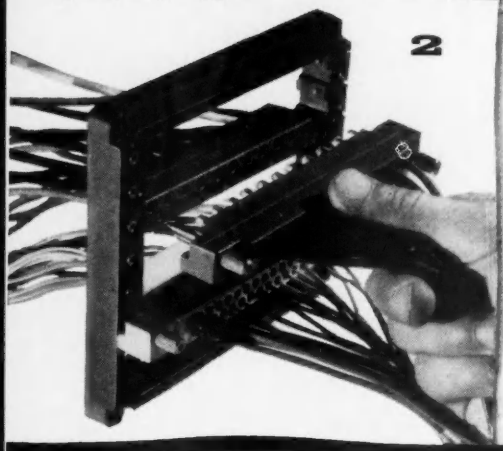

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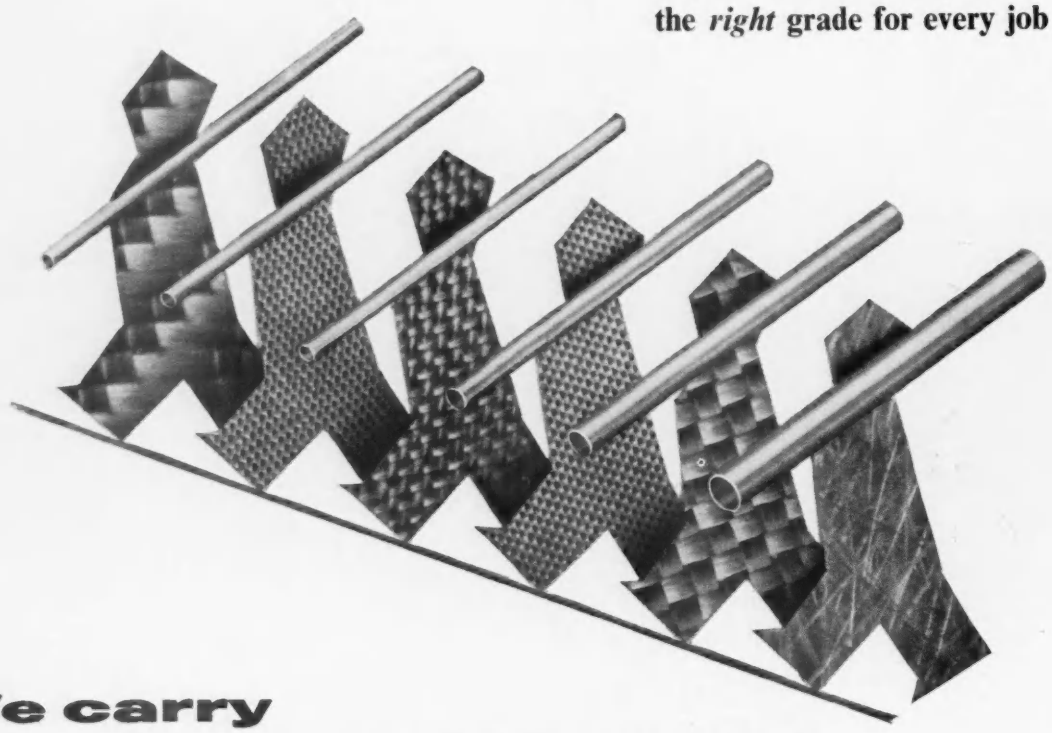

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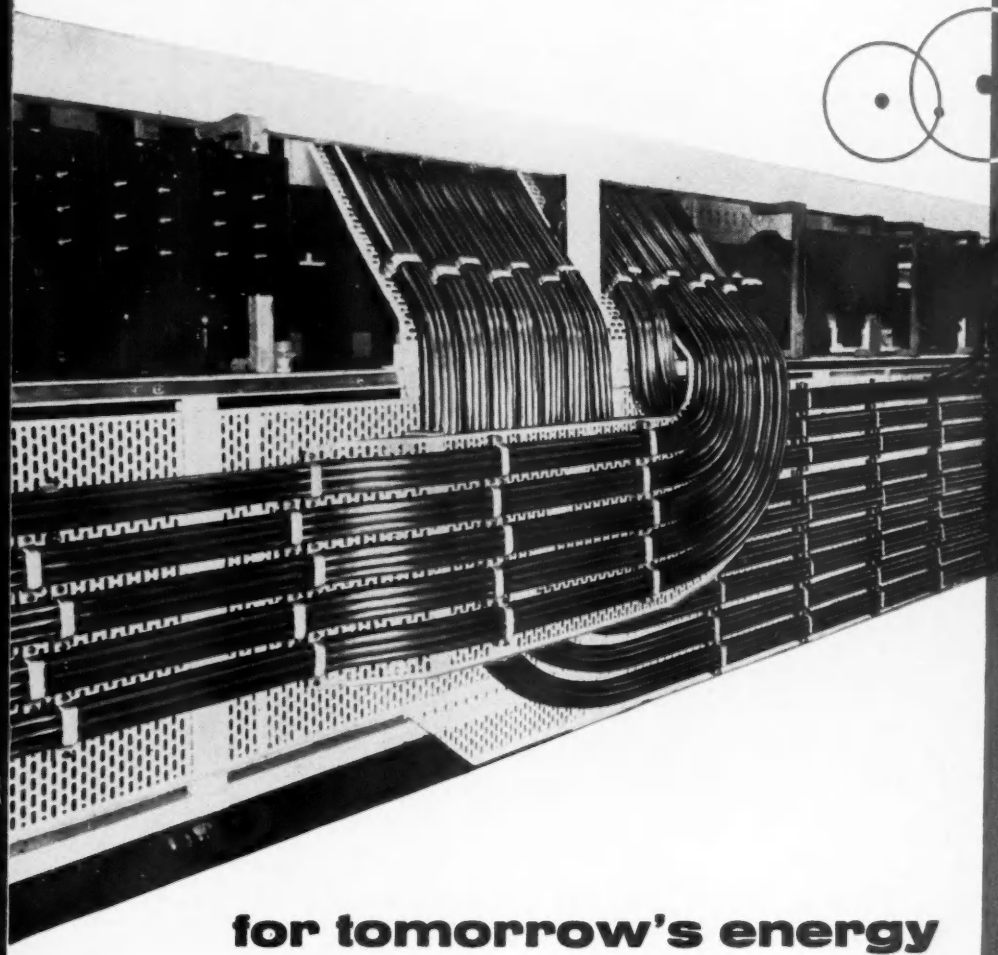

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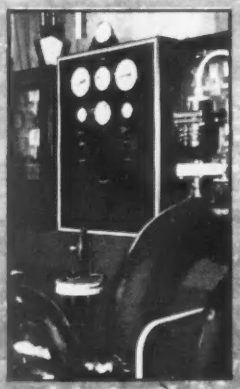

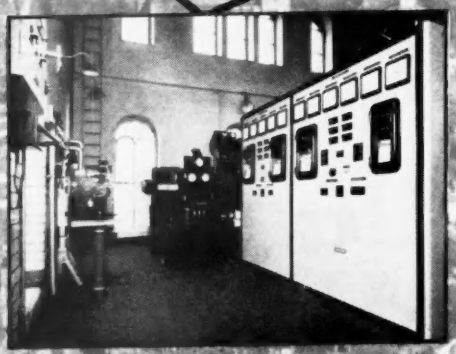

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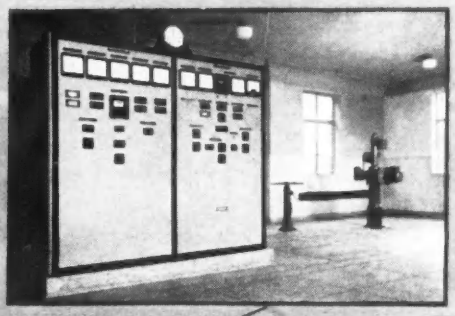

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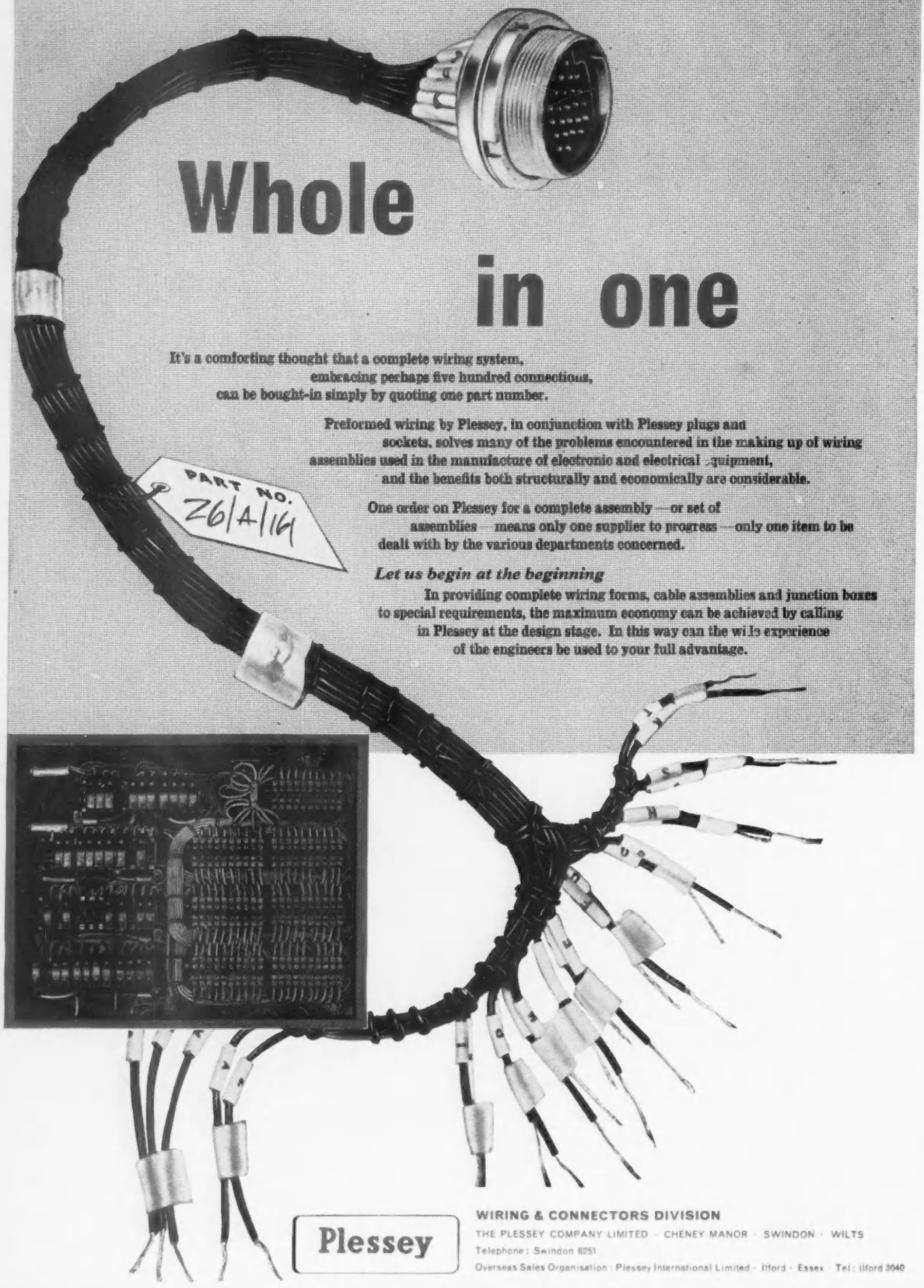

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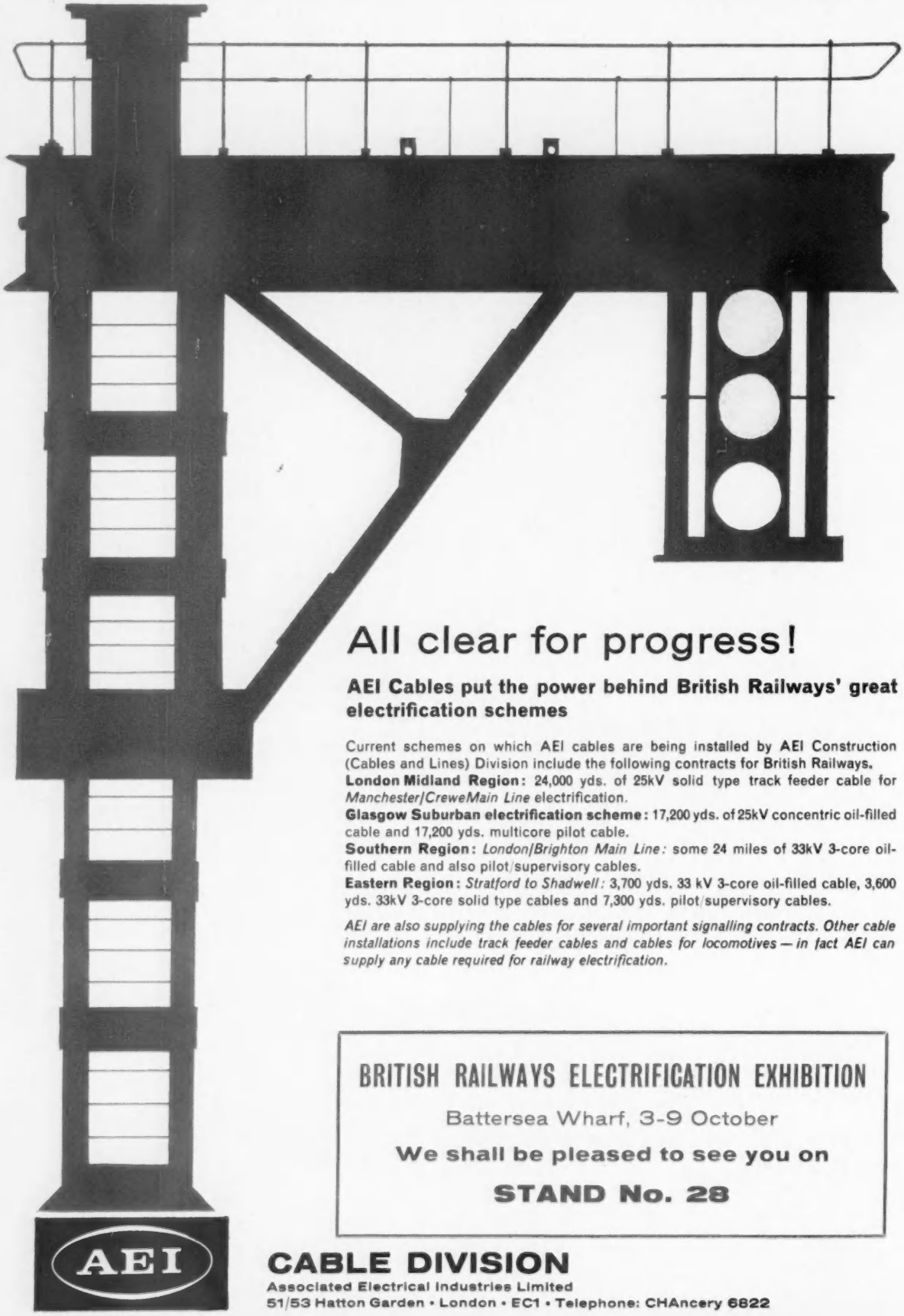

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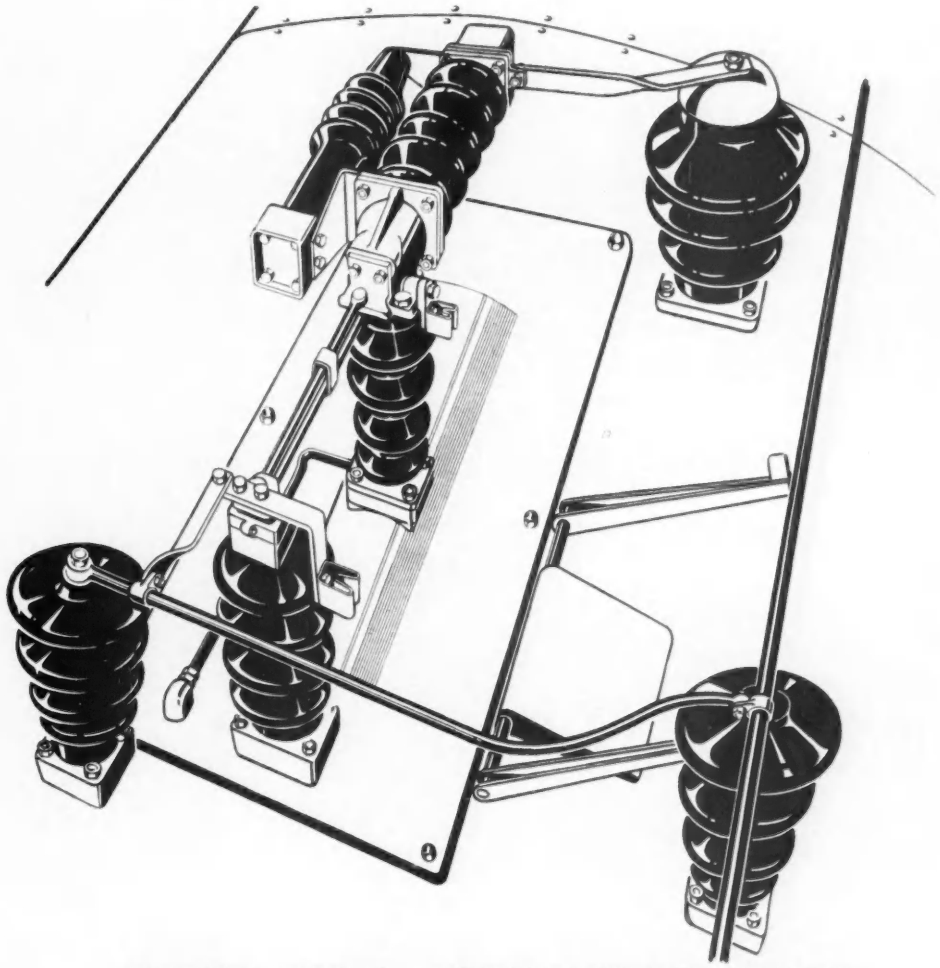

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ASSOCIATED ELECTRICAL INDUSTRIES LIMITED, TRAFFORD PARK, MANCHESTER 17

LH/003

THURSDAY 29 SEPTEMBER, 1960
Registered as a Newspaper Volume 138 No. 13

Dans ce numéro

Alimentation en Electricité en Angleterre **467**

Le rapport annuel de l'industrie nationalisée de l'alimentation en électricité, pour l'Angleterre et le Pays de Galles, montre que, dans les douze mois précédant le 31 mars 1960, il a été vendu un total de 85,719 millions de kWh. La demande maximum a atteint 23,089 MW. Si l'on inclut les bénéfices réalisés sur les contrats et les ventes de détail, l'industrie a réalisé un surplus de 26·7 millions de livres sur un chiffres d'affaires de 552·5 millions de livres. A la fin de la période en question, la capacité de génération installée dans les centrales était de 27,612 MW, et durant cette année, le rendement thermique moyen pour les centrales utilisant le charbon et l mazout a atteint 26·53%.

Eclairage des Routes à Faible Hauteur **474**

On a procédé à des essais avec des lampes placées sur des poteaux de faible hauteur (environ 90 cm.) pour éclairer la surface d'une route, dans l'intention de pouvoir éclairer les croisements de grandes routes. Les essais ont montré que cet éclairage n'est satisfaisant qu'à condition d'utiliser des lampes donnant une limite supérieure extrêment nette au faisceau lumineux.

Electrification ferroviaire par courant alternatif 25 kV 476

Les Chemins de Fers Britanniques ont adopté le courant alternatif 25 kV comme courant normal pour l'électrification des grandes lignes et des lignes de banlieue en 1956, ainsi que 6,6 kV pour de petites sections de ligne où le dégagement est limité. Les premiers 48 km. de grandes lignes ont été récemment mis en service, et des lignes de banlieue dans les régions de Londres et de Glasgow le seront bientôt. Au cours de la conférence qui aura lieu la semaine prochaine, on étudiera 40 communications concernant les locomotives, le matérial roulant et l'équipement des voies. Les locomotives sont équipées de disjoncteurs à soufflage d'arc par air comprimé et de commutateurs de prises pour la sélection de tension et la commande de vitesse, ainsi que de redresseurs à vapeur de mercure pour l'alimentation des moteurs de traction.

In dieser Nummer

Stromversorgungs-Statistik für England und Wales ... **467**

Die in den zwölf Monaten bis 31. März 1960 von der verstaatlichten britischen Stromversorgungsindustrie in England und Wales entgeltlich gelieferte Strommenge betrug laut Jahresbericht insgesamt 85,719 Millionen kWh. Der Spitzenbedarf betrug 23,089 MW. Bei einem Umsatz von £26·7 Millionen wurde ein Einnahmenüberschuss von £552·5 Millionen erzielt, einschliesslich der durch Installationen und Warenlieferungen erzielten Gewinne. Zum Abschluss des gegenständlichen Zeitraums betrug die Gesamtleistung der errichteten Kraftwerke 27,612 MW, wobei der thermische Wirkungsgrad der mit Kohlen- und Oelfeuerung betriebenen Kraftwerke im Jahresdurchschnitt 26·53% betrug.

Strassenbeleuchtung **474**

Versuche mit auf niedrige, etwa 90 cm hohe Tragsäulen angebrachten Strassenbeleuchtungskörpern sind angestellt worden um die Eignung solcher Lampen zur Ausleuchtung von Autobahnkreuzungen festzustellen. Wie die Versuchsergebnisse gezeigt haben, ist diese Beleuchtungsart für den genannten Zweck wenig geeignet solange die verwendeten Lampen keinen nach oben scharf abgegrenzten Lichtkegel ausstrahlen.

Eisenbahn-Elektrifizierung im 25 kV-Wechselstromnetz 476

1956 legten sich die verstaatlichten britischen Eisenbahnen auf Wechselstrom von 25 kV bei Haupt- und Vorstadstrecken bzw. 6,6 kV bei kurzen Strecken mit beschränkter Abfertigungsfrequenz als Norm fest. Die erste elektrifizierte Hauptstrecke im Ausmass von 48 km. wurde bereits in Betrieb genommen; einige Vorstadtstrecken im Gebiete Glasgow und London werden demnächst in Betrieb genommen. An einer nächste Woche tagenden Konferenz kommen 40 Abhandlungen über Lokomotive, rollendes Material und Oberbau-Ausrüstung zur Diskussion. Die bisher eingesetzten Lokomotiven haben Druckluftausschalter und Anzapfumschalter für die Spannungsvorwahl und Drehzahlregelung: die Speisung der Gleichstrom-Fahrmotoren erfolgt durch Quecksilberdampfgleichrichter.

ELECTRICAL TIMES

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Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

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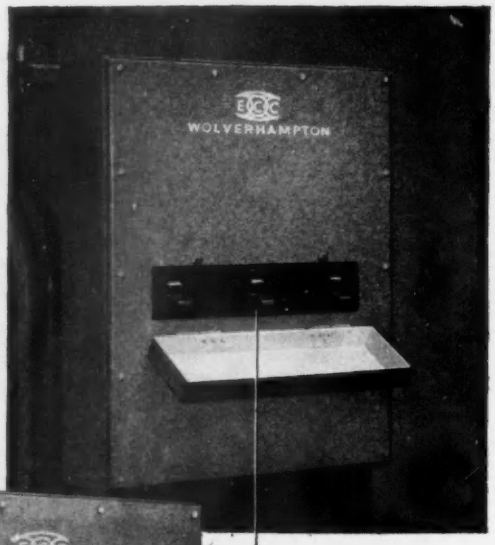
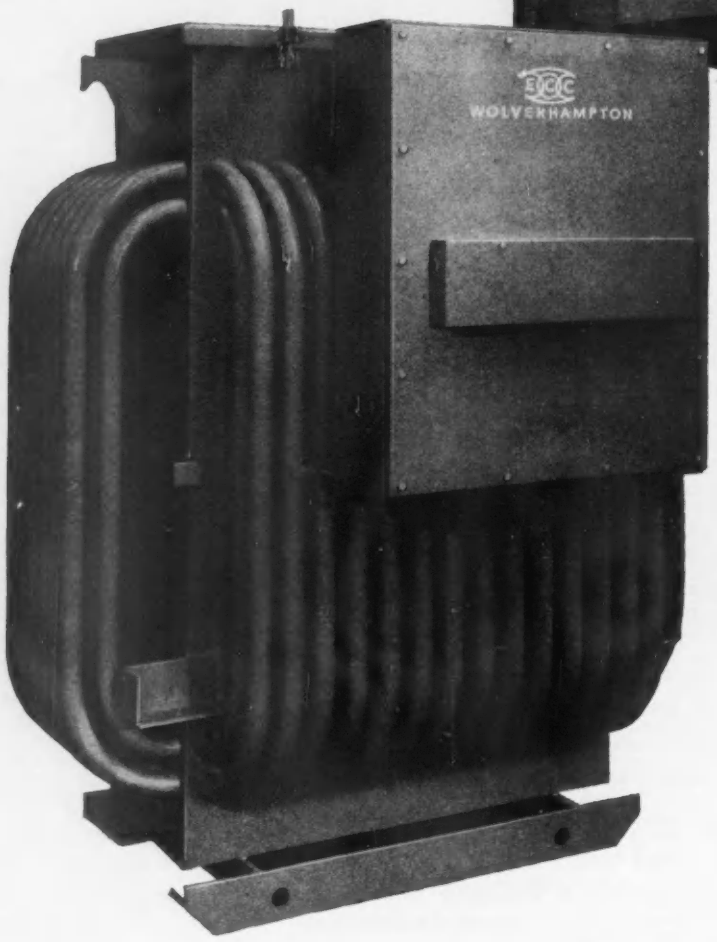
COMBINED TRANSFORMER AND LT SWITCHGEAR UNITS





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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 29 SEPTEMBER, 1960

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Comment

UNEASY BALANCE

The annual reports of the Electricity Council and the electricity boards are the principal account to the public of the way those charged with managing nationalised electricity supply have carried out their task. One of the pleasing characteristics of the reports for 1959-60, published this week, is the improvement in their writing and planning for this purpose. The informed layman who wants to discover what has been happening will find it easier than before, which is all to the good—although that traditional stalking horse of reviewers, the index, urgently needs improvement in both main reports to match the standard of helpfulness of the reports as a whole. What the reports have to say is in many ways as satisfactory as the way it says it. Sales have boomed healthily, technical progress has been rapid, even fuel costs have been effectively reduced. But there are some clouds on this rosy horizon. The surplus earned is slightly down on an increased turnover; and, most important in the light of Government policy and political pressure, self-financing has been achieved in a proportion significantly less than for 1958-59. Next year will see a higher capital investment programme than was originally thought likely, and there cannot be so much help from retailing and contracting activities, outstandingly successful in 1959-60. What these factors signify, considered in the light of events since the reports were signed, we shall discuss next week in our usual extended analysis of the reports. In concluding the present quick survey, tribute must be paid to the continued technical advance the industry has achieved. Though familiar to readers through our regular reports, the progress gains added impressiveness when recorded a year at a time.

APPLIANCES ASCENDANT

Whatever sales and production figures may indicate, the domestic appliance industry is in confident mood. The first year's activities of the BEAMA Domestic Appliances Division have clearly left the manufacturing side stronger and more sure of itself, despite the over-competitive climate that has appeared in some of the larger retail outlets. The Division is conscious of the major tasks that lie ahead. One, of some urgency, is the need to persuade the Government that although changes in hire-purchase regulations may be an effective way of controlling credit in an ebullient economy they leave a trail of havoc from factory to retail shop. The Treasury will not readily forgo so convenient an economic weapon, no matter how dangerous such a blunderbuss may be in the delicate conditions of transition towards European integration. It is in this field of European co-operation that

the DAD has had its most notable success, in the establishment of a bridge between manufacturers of the EFTA and the ECM countries. This cannot be other than beneficial in the changing pattern of trade over the next few years, but inevitably there will remain a period of keen competition. Recent experience has been quickly teaching British firms how to live in such an atmosphere, but they are, in general, still far from taking the initiative; new ideas in equipment are still very much a one-way traffic.

WINDOW FOR TRACTION

The current witticism that it is the railway administration that needs electrifying rather than the lines, finds little support so far as the engineering side is concerned, judging by their initiative in staging the international conference on 25 kV, 50 c/s railway electrification, which commences next Monday. With 40 papers to be presented, supported by a BEAMA-arranged exhibition, and over 200 delegates expected, it is an ambitious project. Particularly so when viewed against the limited achievement of two suburban systems and the solitary Manchester-Crewe section of main line. Yet confidence in the 50 c/s system is having a world-wide echo and in this lies the motive for the conference. With some of the oldest track systems in the world to convert, the papers tell, detail by detail, the story of modernisation; not electrification alone, but the need to replan and rethink anew all aspects of railway engineering. To the non-specialist engineer the lesson is that modernisation is of greater complexity than would at first appear. Much of the conversion work has to be geared down to the slower progress in the traditional field of track betterment. Signalling, also, is making sweeping changes and the newer concepts of centralised dispatching have an impact on the operational side to whom it is not always welcome. It is such suggestions as this that lead to questions on how far the spirit of modernisation extends beyond the engineering side. Happily, however, that is not a question which affects the export significance of 25 kV, 50 c/s rail electrification, with which conference and exhibition are both at heart concerned.

HALF-YEARLY ACCOUNTS?

Estimation of quarterly consumption is now generally used by area boards when a consumer is out at the scheduled call of the meter-reader. Experience with this procedure has persuaded some boards that they can achieve more positive economies through making no attempt to read the meter one quarter in every four, instead submitting a bill based on consumption a twelvemonth earlier. Now at least two boards are working pilot schemes to have half-yearly meter reading only, with estimated accounts submitted for the quarters in between. The Minister of Power has called for the opinion of electricity consultative councils generally on this development; but whatever they may feel from the consumer standpoint, it is doubtful if an extension to half-yearly reading is in the general interests of electrical development. Although any sharp increase in consumption makes such a scheme work to the advantage of the consumer—he can keep his money in his pocket longer—few consumers are likely to view the question that way. Far more apparent to them will be the shock of the extra-high bill that will arrive to adjust for six months of using electricity at a higher rate. The main trend in retailing is towards more frequent charging to meet the convenience of customers. How far can electricity supply afford to run counter to this? Moreover, with half-yearly reading, the meter-reader will presumably have to ensure access on each round, something that may involve a number of calls where both husband and wife go to work. That alone could easily swallow up any savings from fewer scheduled visits. Though experiment with six-monthly reading may be justified, there is no doubt that the results should be interpreted only with care.

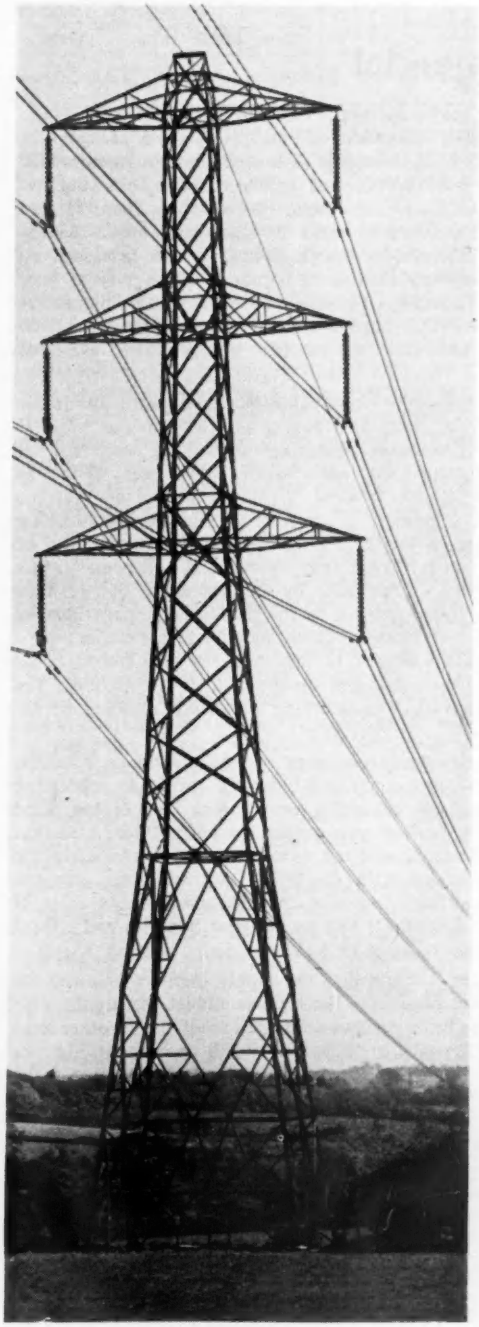
LIGHT ON THE MOTORWAYS

On the question of lighting motorways, the Ministry of Transport has seemed adamant; no general lighting, but an experimental look at whether some form of lighting at intersections may be worth while. This policy comes under implied criticism in the latest report of the DSIR Road Research Laboratory, where there is support for lighting of intersections anyway, and experiments with lighting throughout "in view of the marked effect of improved street lighting on accidents in urban areas and of motorway experience and practice abroad." Cost is, of course, a major factor in any decision about motorway lighting, and it is notable that the MoT, in its limited concern with intersection lighting, has brought up once again the suggestion of low-mounted lamps, the idea that recurs readily amongst engineers not directly experienced in public lighting. A series of trial installations has demonstrated once more the shortcomings of such a system even from the installation design point of view. With lamps mounted 2 ft or 3 ft high, the choice appears to be between glare as one alternative and inefficient seeing conditions on the other. It seems that there is as little prospect as ever for low-mounted lanterns, at least with the equipment at present available. If motorways are to be lit, then more conventional techniques seem likely to be needed. Indeed, one of the developments discussed at length in the report is designed to make such expense more acceptable. It is the exercise of estimating the value of various kinds of road improvement in terms of saved transport costs and lessened social costs through reduction in accidents. Experimental work with lighting on one of the motorways may yet produce a financial case persuasive to the Ministry.

Meteor

This week's quick summary of electrical news faces advertisement page 12

POWER SUPPLY 1959-60



COMMERCIAL . . .

Total electricity sales of 85,719 million units, increase of 9·8%. Industrial units sales up 12·8%, compared with 9·3% increase in index of production. Maximum load 23,089 MW. Load factor 46·9% but on normal weather conditions, 47·4% estimated. Off-peak sales up by 30%. Average price 1·53d falls for second year running.

FINANCE . . .

Consolidated surplus slightly down at £26·7 million on turnover of £552·5 million. All boards show surplus. Sharp increase in sales of fittings profit. Capital expenditure £317·8 million; self-financing falls by 3·8% to 43·6%, but up to expectations. CEGB surplus halved, largely due to change in depreciation practice. Fuel costs fall, improved thermal efficiency cuts cost of generation to 0·678/kWh.

OPERATION . . .

Generation up 9·6% to 100,556 million units. 88,982 million units sold to area boards. Thermal efficiency rose to 26·53% average giving saving of £3·3 million on fuel. Maximum demand 10·5% higher than last year at 23,089 MW. CEGB sales rose 10·1%. 4·2% reduction in price per unit.

GENERATING PLANT . . .

Output capacity of new plant in year 2,219 MW, including six new stations, gives increase in output capacity of 9·1% to 25,529 MW. Plant programme, 1960-64, provides for further 11,350 MW, including 1,825 MW of nuclear plant; 650 MW more plant in 1964 to compensate past underestimating. 500 MW single-line set likely in 1965.

TRANSMISSION . . .

691 route-miles of main transmission line added. Supergrid reached 1,316 miles. 27 new grid substations brought into operation, total transformer capacity increased 13%. Site work started for cross-Channel cable. Work advanced on design for 380 kV transmission, 500 kV under active investigation.

The Industry's Report . . .

FOURTEEN reports supply the figures summarised on the preceding page; the report of the Electricity Council speaking for the industry as a whole, and that of the CEGB and the 12 area boards going into detail of the respective spheres of interest. The reports survey the second year of working of the supply industry in England and Wales in its new form, and the introductory chapter in the EC report tackles one of the most intractable problems facing the industry: What is the suitable yardstick for measuring the efficiency of a monopoly? Self examination and research are the methods adopted, with intense exploitation of engineering and scientific developments. "Greater efficiency through advances in technology" is how the chapter heading puts it.

In statistical terms, use of this technique enabled the supply industry to supply each million kWh of electricity to the community during 1959-60 with 2·2 employees as against 4·2 ten years ago. Again, the sale of electricity at only 25% more than the average price ten years ago means in terms of real value that it is 17% cheaper.

Concern with organisation as a way to better efficiency shows particularly clearly in the CEGB report. Every opportunity is taken, the report claims, to promote the declared policy of seeing that executive responsibility resided as close to the operating level as possible. Competitive spirit between the regions has been fostered by comparing performances in many fields.

The EC in its work relies largely on debate and discussion in full council and in a number of standing committees, while chief officers of the Council and the area boards meet periodically in functional conferences to deal with matters of common interest to the industry. The Council, represented by the chairman and the full-time members, have meetings from time to time with the Minister of Power and with various Government departments, covering a wide range of matters.

Reports of individual area boards will be surveyed in more detail in next week's "Electrical Times"

Amongst the important functions of the EC is general oversight of labour matters throughout the supply industry. The report records an increase of 5·5% and 5·1% in employees in managerial and higher executive, and technical engineering grades, respectively, but only 0·7% and 0·3% increases in executive, clerical and accountancy, and manual workers, respectively, despite the big increase in output. Numbers of technical trainees and apprentices decreased, but a welcome note of hope is an increase from 22 to 41 in the number of graduates who commenced training in the industry. A similar improvement is noted in the proportion of student apprentices joining the industry after taking the General Certificate of Education examination at the advanced level.

During the year the Council acted in its role of court of appeal for consumers dissatisfied with board decisions on seven occasions. In five cases the Council's opinion was conveyed to the parties concerned; in one, agreement was reached between board and consumer; and in the other the Council did not consider itself the right body to deal with the matter.

Table I.—Supply Industry Staffs (1960)

Authority	Managerial and Higher Executive	Tech. Eng.	Executive Clerical, Accountancy, Sales	Manual	Technical Trainees, and Apprentices	Totals
Generating Bd. (1960)	623	7,971	6,088	36,185	2,160	53,027
(1959)	*534*	*7,518*	*5,907*	*37,038*	*2,131*	*53,129*
Electricity Council (1960)	71	21	332	94	—	518
(1959)	*77*	*20*	*338*	*100*	—	*535*
Area Boards (1960)	832	9,356	35,200	83,888	5,792	135,068
(1959)	*836*	*8,964*	*35,099*	*82,725*	*5,871*	*133,495*

Commercial . . .

THREE major factors affected electricity sales during the year. On the industrial side there was a recovery in activity following the earlier slow-down, and in the domestic field there was the effect of appliance sales following the removal of credit restrictions, but to offset these factors was the fine summer and comparatively mild winter weather. However, although electricity sales increased by 9·8%, the system maximum demand, which was at 5.30 p.m. on Thursday, 14 January, was 10·5% higher at 23,089 MW. This compares with the estimate of 22,900 MW for the m.d. in weather of "average cold-spell severity."

In consequence of these values the load factor was lower at 46·9% compared with 47·0% for the previous year. It is estimated, however, that had the weather been normal throughout, the load factor would have been 47·4% as against 46·5% for 1958-59. Thus it would seem that the efforts of the industry to improve load factor is continuing to bear fruit. Notwithstanding weather conditions, sales of electricity under restricted hour and off-peak tariffs increased during the year by no less than 30·2%. This reflects the rapid growth in thermal-storage space heating and for Great Britain (which includes the excellent progress made in Scotland) no less than 350 MW was installed during the year, bringing up the total to 1,100 MW; the installed load for floor-warming was nearly doubled during the year.

During the year, nine area boards revised their tariffs, mainly the commercial and industrial tariffs, to reflect the higher fixed charge and lower running cost of the tilted bulk supply tariff. It was during the current year also that the CEGB introduced the new feature of a special rebate for large disconnectable loads. By the close of the year, the Council had been consulted by three area boards on tariff revisions for 1960-61; two for off-peak supplies and a third for a general revision of tariffs.

The claim is made that the supply industry has met the Government request to keep prices stable. During the year the average price per unit sold fell for all classes other than farms and traction. The overall figure was 1·530d per unit, 3% down on the 1·577d of last year. One of the major influences in this reduction has been the fall in industrial unit charges as a result of the coal price adjustment clauses. This has arisen from the lower coal prices in the year due chiefly to the concentration of coal production in lower cost areas, made possible by improved transmission facilities. This is the second year running in which there has been a fall in the average price per unit sold.

In a study of the individual classes of consumers, the report of the Electricity Council underlines the industrial recovery. Sales to industrial consumers were 12.8% up on the previous year compared with an increase of only 9.3%

Table II.—Analysis of Area Board Sales to Consumers, 1959-60 (in Thousands of Units)

Area Board	Domestic	Farm	Commercial	Combined Domestic and Commercial	Industrial	Public Lighting	Traction	Total Sales to Consumers	% Increase in Total Sales to Consumers over 1958-59	Inter-Board Sales	Total Sales	No. of Consumers
London ...	3,148,615	650	2,272,047	—	1,966,488	117,837	25,233	7,530,870	5·90	1,971	7,532,841	1,772,391
South Eastern	2,561,109	111,253	712,922	139,779	1,614,915	50,416	7,896	5,198,290	7·61	139,221	5,337,511	1,253,431
Southern ...	2,834,924	216,651	932,955	157,806	2,664,086	50,259	18,801	6,875,482	10·08	11,323	6,886,805	1,388,467
South Western	1,356,269	121,319	643,614	—	1,113,120	27,594	—	3,261,916	9·97	28	3,261,944	771,241
Eastern ...	3,653,492	196,092	1,110,504	181,690	3,128,942	72,136	33,650	8,376,506	8·77	7	8,376,513	1,788,514
East Midlands ...	2,070,344	180,280	769,548	134,065	3,854,021	56,698	19,804	7,084,760	10·17	—	7,084,760	1,335,368
Midlands ...	2,604,721	166,081	819,524	203,245	5,504,410	65,016	19,677	9,382,674	11·05	4,927	9,387,601	1,423,612
South Wales ...	915,025	59,679	383,189	—	3,932,168	31,267	9,158	5,330,486	9·60	89	5,330,575	639,165
M. and N. Wales	1,527,278	108,128	644,091	91,330	3,137,571	47,709	—	5,556,107	9·78	—	5,556,107	926,384
Yorkshire ...	2,236,244	117,561	771,043	207,006	5,796,770	78,052	60,406	9,267,082	11·86	85,116	9,352,198	1,516,508
North Eastern	1,357,884	77,044	588,591	—	3,078,136	44,690	34,413	5,180,758	9·39	—	5,180,758	1,039,205
North Western	2,633,077	159,819	895,216	265,269	5,017,902	87,328	22,605	9,081,216	8·17	4,115	9,085,331	1,645,552
Tot. Area Bds.	26,898,982	1,514,557	10,543,244	1,380,190	40,808,529	729,002	251,643	82,126,147	—	246,797	—	15,499,838
C.E.G.B. ...	—	—	—	—	2,296,063	—	1,296,709	3,592,772	—	—	—	—
TOTAL ...	26,898,982	1,514,557	10,543,244	1,380,190	43,104,592	729,002	1,548,352	85,718,919	—	—	—	—
% inc. total sales over 1958-59	7·87	1·13	5·50	9·61	12·75	8·07	2·38	9·75	—	—	—	—

in the index of industrial production over the same period. This recovery from the industrial slow-down varied from industry to industry, and in heavy engineering, recovery did not start until the second half of the year. More than half the total sales to industry is used by four main groups —chemicals, iron and steel, shipbuilding and engineering, and coal mining. It is stated that the main industrial demand is for power and lighting; process heating has been mainly confined to specialised tasks. However, use of electricity is extending into more common industrial fields and, although the present demand is small, there is a great potential for development. An instance of this is the proposal to replace open hearth furnaces by electric arc furnaces in a large steel plant by 1963, an installation that will need some 750 million kWh/year.

Sales to domestic consumers were 7·9% higher while the average consumption per domestic consumer was at a lower figure of 6·2%. It is pointed out that, in the future, growth in sales will depend increasingly on this average consumption. It is a figure which gives a measure of the contribution of electricity in removing drudgery from the home. A caution is uttered on the need for balanced development, with encouragement of appliances with all-the-year-round use in order to provide a complementary load to the strong seasonal characteristics of lighting and space-heating. The exceptional progress that has been made in the sales of such appliances in this first year without hire-purchase restrictions is stressed, refrigerator sales being over double those of the previous year. It is this sensitivity of appliance scales to external factors, particularly those requiring heavy financial outlay by consumers, that makes it difficult for the industry to progress towards securing a balanced development.

Reference is made in the report to the need for adequate wiring installations. Evidence on this point was given during the year to the Housing Standards Sub-committee of the Ministry of Housing and Local Government. The evidence also referred to the use of off-peak electricity and in particular to the prospect of stable off-peak tariffs for some years ahead.

Progress continues to be made in rural electrification and at 31 March, 1960, 224,743 farms were connected to supply, 80·7% of the potential total of such consumers. The target was to have 85% connected by March, 1963. Rural premises other than farms show up even better with 93% of the potential total connected. The average consumption per farm during the year was 6,739 units, a figure on the low side because the demand for electricity for crop drying fell off owing to the warm, dry summer.

In view of the high cost of rural electrification, increasing emphasis is being placed on improved and new uses of electricity in agriculture and horticulture as well as encouraging its wider application in other rural premises. Some of the more interesting developments have been towards control of environment for animals reared under intensive conditions; grain-drying by an electrical system of tray-drying, the spread of hay-drying in the bale and a marked increase in the use of electricity for horticultural propagation.

Sales to commercial consumers rose by only 5·5% during the year. This class of consumer comprises mainly 50% shops, 17% offices and 15% public buildings and here the popularity of thermal storage space-heating continues to grow while greater use is being made of refrigerated windows and display cabinets. Public lighting consumption rose by 8·0%, which reflects the need for improved road conditions. Attention was drawn to the experiments in the use of electric heating to prevent ice formation on roads, a further means of increasing road safety. A reduction in the sales of electricity for street traction is again recorded, −13.4% in the past year due to the gradual replacement of trams and trolley-buses.

Table III.—Financial Results of Each Area Board

Area Board	Trading Revenue	Purchase of Electricity	Trading Surplus	Interest Financing Expense and Central Reserve Fund	Net Surplus		Transfer to Area Reserve Fund	Balance Carried Forward
					1959-60	1958-59		
	£	£	£	£	£	£	£	£
London	63,154,825	40,569,403	5,500,177	2,194,119	3,673,144	3,629,012	1,000,000	2,613,295
South Eastern ...	37,276,456	27,526,292	1,453,537	1,559,765	142,214	−753,111	—	746,596
Southern ...	47,307,517	33,369,948	3,363,432	2,226,315	1,439,040	1,659,760	—	2,353,205
South Western ...	24,149,764	15,337,856	1,940,904	1,260,397	879,009	612,386	400,000	341,435
Eastern	60,528,765	40,787,415	6,377,518	3,118,229	3,866,373	3,272,613	1,750,000	265,856
East Midlands ...	44,500,134	29,944,525	3,566,438	2,229,204	1,528,136	1,860,098	1,000,000	409,393
Midlands... ...	58,672,093	41,162,727	5,083,015	2,599,843	2,808,932	118,608	2,000,000	1,311,466
South Wales ...	28,264,005	19,604,668	1,917,866	1,600,789	555,172	486,917	1,250,000	639,060
M. and N. Wales	32,888,561	22,775,714	2,542,213	1,349,056	1,426,733	129,271	1,592,000	435,679
Yorkshire ...	52,151,263	35,616,219	4,108,253	2,514,898	1,944,494	1,165,929	892,000	427,682
North Eastern ...	32,080,452	21,176,428	2,512,436	1,471,678	1,318,850	871,564	750,000	1,508,122
North Western...	55,831,681	39,866,048	3,474,110	2,207,283	1,630,495	2,012,449	1,000,000	1,088,149
Totals	535,646,231	366,577,958	41,839,899	24,331,576	21,212,592	16,571,718	11,634,000	12,139,938

Table IV.—Consolidated and CEGB Accounts 1959-60

Item (Figures for 1959 refer to consolidated accounts only)	Industry as a whole	Central Electricity Generating Board
	£	£
Sales of electricity	537,761,356	379,781,492
Interchange with S.S.E.B.	606,598	606,598
Sales of Steam	921,676	921,676
Rentals	2,377,994	—
Income from public lighting maintenance	2,953,010	—
Surplus on contracting and sales of fittings	6,610,083	—
(1959: £516,716,461)	**551,230,717**	**381,309,766**
Deduct:		
Generation costs	242,217,364	242,199,993
Purchase of electricity from other sources	3,338,587	2,485,909
Main transmission costs	3,819,393	3,819,393
Distribution costs	31,630,265	—
Consumer service	15,995,528	—
Meter reading, billing and collection of accounts	10,498,756	—
Administration and general expenses	15,968,909	3,883,932
Training, safety and welfare	7,061,539	2,735,435
Research and development	1,403,207	1,201,912
Rents, insurance, etc.	2,713,705	1,071,130
Payment in lieu of rates	24,487,129	12,051,435
Supply system changes (consumers' apparatus)	3,009,919	—
Proportion of Electricity Council's expenses	—	451,498
Depreciation of fixed assets	93,343,180	57,490,431
1959: £427,608,354)	**455,487,481**	**327,391,068**
Consolidated Trading Surplus:		
(1959: £89,108,107)	**95,743,236**	**53,918,698**
Add.		
Miscellaneous Interest receivable	—	65,199
Income from subsidiary companies	97,008	68,779
Rents receivable and other miscellaneous income	1,208,170	120,832
(1959: £1,029,439)	1,305,178	254,810
(1959: £90,137,546)	97,048,414	54,173,508
Deduct:		
Miscellaneous Interest	—	44,447
Contribution to E.C. Expenses:		
Interest	67,715,426	46,239,242
Financing expenses	173,468	114,056
Intangible assets: Amount written off "balance of consideration for undertakings acquired"	2,000,000	2,000,000
Central Guarantee Fund	500,000	328,835
(1959: £62,802,340)	**70,388,894**	**48,726,580**
Surplus before transfer to Reserves:		
(1959: £27,335,206)	26,659,520	5,446,928
Deduct:		
Transfers to Taxation Reserves	3,550,000	—
Transfers to Supplementary Reserves for Depreciation of Fixed Assets	3,050,000	—
Standardisation of Systems of Supply Reserves	950,000	—
Net Surplus available for General Reserves:		
(1959: £12,252,206)	**19,109,520**	**5,446,928**
Balance brought forward from previous period	—	803,847
Deduct:		
Transfers to Generating Reserve Fund	6,000,000	6,000,000
Transfers to Area Reserves Funds	1,634,000	—
Balance for year unappropriated:		
(1959: £785,167)	**1,475,520**	**−553,072**
Add:		
Balance carried forward	10,915,193	803,847
Balance carried to Balance Sheet	**12,390,713**	**250,775**

A compensating factor is the expected rapid increase in electricity sales to the British Transport Commission over the next five years as the railway modernisation plan is implemented.

Special attention is given in the report to the safety of electrical installations and apparatus and some figures are put forward showing that only one in 400,000 persons at risk dies through accidents involving electrical appliances. A tribute is given to the work of the National Inspection Council for Electrical Installation Contracting, and reference made to the evidence, both written and oral, that the Electricity Council had given to the Molony Committee on consumer protection. This committee was particularly interested in the proposed national scheme for protecting the public by approving domestic appliances.

Financial . . .

COMBINED surplus of all sections of the supply industry in the year under review was £26·7 million, remarkably close to the £27·3 million of 1958-59; with the important difference that this time it was earned on a turnover of £552·5 million, as against the earlier £517·8 million. Ratio of surplus to turnover has thus fallen from 5·28% to 4·82%. The report, looking at the figure from another aspect, notes it as representing less than one tenth of a penny for each unit sold. These figures include only surplus, not turnover, for contracting and sales of fittings.

All the area boards record substantial surpluses, although these vary widely from £0·1 million to £3·6 million, while the CEGB shows a big drop in its surplus, from £10·8 million for 1958-59 to £5·4 million.

On the income side of the revenue account, notable changes are an increase of £32·0 million in sales of electricity, and £2·9 million in the surplus earned on contracting and sales of fittings. On the expenditure side, the big changes were £12·9 million more for depreciation, £7·6 million more in interest charges, and £8·1 million more in cost of generation.

Most of the increased revenue came from the increase in sales, but no less than £2·0 million is attributed to changes in retail charges, although the average revenue per unit fell slightly because of increased use by consumers. Increase in aggregate cost of generation attributable to increased sales was partly offset by better thermal efficiency, and partly, surprising though it may seem, by lower fuel costs.

Income from industrial consumers, at £224·5 million was 6·8% up on the previous year, for a 12·8% increase in units sold, compared with combined farm, domestic and commercial income 6·1% up for a 7% increase in units sold, and an aggregate income of £300·7 million.

The contracting and sales of fittings figure account shows a surplus of £6·0 million after allowing for estimated rents, rates and insurance, compared with £3·1 million last year. The turnover in the two years is £69·5 million and £56·6 million; and whereas in 1958-59 hire-purchase represented 49·1% of turnover, in the year under review it had risen to

Table V.—Output from Stations, 1959-60, and Grid Transmission Summary (Grouped in Divisions)

Generation Division	No. of Stations	Maximum Output Capacity at 31.3.60 (MW)	% Change on 1959	Units generated x 1,000	Units used in stations x 1,000	Units sent out x 1,000	% Change on 1959	Works cost per Unit s.o. pence	Capacities of Main Transformers (MVA)			Lines and Cables (route miles)		
									at 275 kV	at 132 kV	below 132 kV	at 275 kV*	at 132 kV	below 132 kV
London	35	3,799	6·32	11,764,379	756,473	11,007,906	−1·52	0·7964	—	2,300	1,436	—	104·10	174·25
S. Eastern	18	1,528	7·83	5,524,744	330,642	5,194,102	2·10	0·7102	240	2,123	60	12·86	410·90	4·62
Southern	19	1,229	6·68	5,424,503	251,455	5,173,048	16·43	0·5826	1,320	2,817	200	156·52	693·83	114·83
S. Western	12	1,166	10·83	4,164,478	221,736	3,942,742	12·75	0·6564	—	1,930	—	17·39	495·16	3·22
Eastern	22	1,824	9·81	6,279,862	335,072	5,944,790	4·13	0·6599	480	3,440	100	144·10	661·02	5·00
E. Midlands	15	3,015	27·86	13,318,401	829,794	12,488,607	28·60	0·4931	1,200	2,885	—	291·85	637·68	9·13
Midlands	16	2,466	1·73	9,367,141	604,648	8,762,493	3·61	0·5946	720	3,280	—	119·84	422·00	—
S. Wales	12	1,494	8·49	6,836,267	449,491	6,386,776	0·15	0·6042	480	2,015	—	61·80	401·38	17·79
Yorkshire	20	3,019	9·50	13,996,943	838,459	13,158,484	12·62	0·5056	960	2,930	140	143·92	408·42	15·49
N. Eastern	12	1,570	4·04	7,877,334	475,391	7,401,943	37·2	0·5180	720	1,260	—	145·51	234·75	—
N.W., M. & N. Wales	53	4,419	7·25	16,001,809	974,919	15,026,890	2·21	0·6398	1,800	6,470	—	221·86	891·92	6·95

* *Includes some lines operating at 132 kV.*

56·6%. Turnover on contracting work hardly changed between the two years; the increase was almost entirely in terms of sales of fittings.

Considering the £35·4 million increase in expenditure during the year, the report suggests that some £25 million can be attributed to continued expansion of the industry. For the rest of the increase, the following explanations are offered:

An increase of £6·0 million in depreciation provisions follows from a change in practice, with depreciation charged from when expenditure is incurred rather than from dates of commissioning. This charge goes far to explain the fall in CEGB surplus.

An increase of £1·6 million in local rates arises from revised arrangements under the Local Government Act, 1958.

Salary and wage awards are estimated to account for about £2·1 million in terms of charges to revenue account (some of the effects of wage and salary awards are of course seen in the capital account).

Provision had to be made from revenue of about £0·9 million to met a probable deficiency in the manual workers' superannuation scheme.

Looking more closely at the biggest item on the expenditure side of the revenue account, generation of electricity, the report notes a sharp fall from 0·724d in terms of cost per unit sold in 1958-59, to 0·678d in the year reviewed. Delivered cost of fuel represents 83% of works costs. Average delivered cost of fuel adjusted to a calorific value of 11,000 B.Th.U./ton was down to 79s 11d/ton, compared with 83s 11d/ton in the previous year, a saving worth £9·9 million. The improvement in thermal efficiency is estimated to be worth £3·3 million.

Allocation of the surpluses earned during the year shows a continuation of previous practice in many respects. Area boards put £3·6 million to taxation reserve funds and £1·0 million to reserves for standardisation of supplies. The CEGB put £6 million to its reserve fund (taking some from balance brought forward), while altogether £11·6 million went into area reserves.

Turning now to consider the capital expenditure of the industry during 1959-60, the total expended on fixed assets was £311·3 million, compared with an approved (and pre-estimated figure) of £303·5 million. In addition, £6·5 million was paid by the CEGB to the UKAEA for nuclear fuel for the initial charges of nuclear power stations; such initial fuel is reckoned to have a capital rather than a revenue nature. All-in-all, then, the industry invested some £317·8 million during the year. The report suggests that comparison of Ministerial-approved totals and actual capital expenditure in any one accounting year has little significance because of chance time effects.

During the year, there was a sharp decrease in working capital employed in the industry, so the actual increase in capital was only £304·5 million, of which £200 million is attributable to the CEGB. About 43·6% of the new capital was obtained from internal sources, as against 47·4% in 1958-59. The fall is ascribed to particularly heavy incidence of capital expenditure in the year reviewed; but the figure is said to be broadly what was expected. Actual borrowings during the year were £189·6 million net, provided by the Exchequer at rates of interest varying from $5\frac{1}{8}$% to $5\frac{1}{8}$%.

For the current financial year (1960-61) the Electricity Council originally estimated capital expenditure at £275·4 million plus £10·5 million for nuclear fuel. However, these estimates have now been increased and at the time of the report were under consideration by the Government.

Written-down value of total fixed assets employed in the supply industry at the end of the year reviewed was £1,850·1 million, £1,241·7 million being attributable to the CEGB. The borrowing limit without a new Order by the Minister of Power is likely to be reached early in 1962; a resolution of the House of Commons is required if the limit is to be extended.

Table VI.—Details and Costs of Thermal Stations

Item	Units	1958-59	1959-60	% change
Stations (sites)	No.	207	203	−1·94
Max. output capac. Mar. 31	MW sent out	23,252	25,386	+9·17
Electricity:				
Generated	kWh x 1,000	91,565,462	100,411,307	+9·60
Used in stations ...	kWh x 1,000	5,514,576	6,065,345	+9·99
Sent out	kWh x 1,000	86,050,886	94,345,962	+9·63
Average load	% max. cap.	43·16	44·09	+2·15
Fuel:				
Consumed	tons x 1,000	45,749,363	48,841,136	+6·75
Ave. cal val.	B.Th.U./lb.	10,979	11,090	+0·01
Heat rate	B.Th.U./kWh s.o.	13,075	12,860	−1·65
Av. therm. eff.... ...	%	26·10	26·53	+1·64
Pulverised	% of coal	66·69	69·95	+4·88
Cost/kWh sent out:				
Fuel, inc. transport ...	d.	0·5343	0·5003	−6·37
Fuel handling	d.	0·0244	0·0231	−5·33
Opn. sals. and wages ...	d.	0·0396	0·0375	−5·31
Oil, water, stores ...	d.	0·0038	0·0039	+2·65
Repairs and maintenance	d.	0·0424	0·0388	−8·5
Total works cost ...	d.	0·6445	0·6036	−6·35
"Generation employees"/ MW of output capacity	No.	1·63	1·50	−7·98

System Operation . . .

GENERATION of electricity rose during the year by 9·6% above the 1958-59 level to 100,556 million units. This rise in generation was accompanied by an increase in average station thermal efficiency to 26·53%, with a consequent saving in fuel costs for the year of £3·3 million.

Operational particulars of the 20 most efficient steam stations show that they operated with an average efficiency of 30·95% compared with a 26·53% average for all steam stations, and that the highest efficiency was 34·31%. Stations having an efficiency in excess of 24% constituted 58·3% of total output capacity and provided 79·1% of the total output.

The reduction in works cost enabled the price per unit sent out to be reduced by 6·3% to 0·6063d. Improved generation efficiency enabled the heat consumption per unit to be reduced by 1·6% and there was also a reduction of 4·8% in the average delivered price of heat. Coal accounted for 88·6% by weight of the total fuel used at 43·4 million tons. There was a rise in fuel oil consumption resulting from arrangements made in 1954-55, to 4·4 million tons and the total fuel consumption in coal and coal equivalent rose by 8·6%.

Arrangements for holding excess stocks of coal were agreed with the National Coal Board at the beginning of the year, but by March, 1960, the winter stocks had been reduced to a more economical level at 4·5 million tons. Coal is now being transported increasingly by rail in accordance with an agreement with the BTC.

Sales of electricity by the CEGB rose by 10·1% to 93,042 million units; 88,982 million units were sold to area boards and 3,593 million units direct to consumers. Inter-transfer continued with the SSEB and resulted in a net sale of 467 million units.

Area boards benefited from a revised bulk supply tariff which related the fixed charge per kW to more nearly the Board's fixed costs. The average price per unit fell by 4·2% below the previous year's average to 0·9812d. Compared with 1958-59 the demand charge was increased by £1 2s to £7 2s per kW and the running charge reduced to 0·41d per unit. The sum of the actual maximum demand during the year was 22,846,642 kW. The maximum system demand occurred on 14 January and was 23,089 MW, 10·5% higher than last year.

During the year, the special tariff for electrical loads restrictable by 25 MW for two hours was introduced.

Sales of steam for industrial use rose by 26·8% over the year, largely as a result of the new back-pressure station at Spondon. The total revenue from this source amounted to £921,676.

Ash disposal still presents a severe problem. During the year over 8·5 million tons, mainly from pulverised burners, required disposal. A new lightweight aggregate sintering plant was completed at Northfleet and negotiations for plants at four other power stations are proceeding.

Generating Plant . . .

TOTAL output capacity of the CEGB's generating plant rose in the year ending 31 March by 9·1% and included 2,219 MW of new plant. This increase in capacity was achieved by commissioning six new stations—Aberthaw, Belvedere, Drakelow B, Elland, High Marnham and Northfleet—and by extending 12 existing stations. The programme included the first 200 MW set at High Marnham, supplied with steam from a 1,400 klb/hr boiler.

Maximum output capacity of the Board's 234 power stations at 31 March was 25,529 MW and during the months of December and January, when demand for electricity is normally the greatest, availability of generating plant reached a new record level of 92·6%.

In the five years 1960-64 over 11,350 MW of new output capacity is planned; equivalent to a 45% increase on capacity of plant in service at the beginning of 1960. By 1965 it is estimated that average station thermal efficiency of steam plant will be of the order of 30% and that nuclear energy and oil will each contribute about 10% of the Board's total energy requirements.

In addition to the main new plant programme for 1964 of 1,727 MW s.o., there is also a supplementary programme for 650 MW s.o. This supplementary programme has been considered necessary because, although over a short-term period estimates of growth have been reasonably accurate, over a longer term they show a tendency to persistent under-estimation. It has therefore been decided, in consulation with the Electricity Council, to give greater weight to past trends. The previous estimate for 1964 has been raised by nearly 1,200 MW. 650 MW s.o. will be new plant comprising 350 MW coal-fired units, one at Blyth B and the other at Drakelow. The remainder of the 1,200 MW will be obtained by prolonging life of existing old plant.

The year was notable for the placing of contracts for 300, 350 and 550 MW generating units, all designed for steam conditions of 2,300 lb/sq in. at 1,050/1,050°F with reheat.

Decisions to place orders for two 375 MW units operating at the supercritical pressure of 3,500 lb/sq in. were taken and it is now considered practicable to construct a single-line 500 MW unit in 1965. Although the supercritical sets have improved efficiency giving a reduction in fuel cost, at present this advantage is largely offset by the higher plant costs. With a view to stimulating development of materials and techniques enabling these costs to be reduced, orders have been placed for a further two supercritical 375 MW units, one for commissioning in 1965 and the other for 1966.

Table VII.—Efficiencies of Steam Stations 1959-60

Thermal efficiency for year %	Max. capacity % of total 31.3.60	kWh output % of total 1959-60	1958-59
34 and over	1·4	1·5	—
32 to 33·99	6·8	9·0	4·7
30 to 31·99	7·6	13·9	15·0
28 to 29·99	15·7	21·5	26·1
26 to 27·99	18·3	24·3	21·2
24 to 25·99	8·5	8·9	12·6
22 to 23·99	12·9	10·5	9·2
20 to 21·99	9·0	5·6	5·5
18 to 19·99	6·2	2·5	2·6
Under 18	13·6	2·3	3·1

Hand-in-hand with commissioning of new plant goes the shutting down of stations whose useful life is coming to an end. In the last 12 years the number of stations has fallen from 291 to 234, yet the output capacity has risen almost 2½ times. There are now 19 stations with an installed capacity greater than 320 MW and the number with a capacity of less than 10 MW has fallen from 140 to 40.

Work continued on the three nuclear power stations at Berkeley, Bradwell and Hinkley Point satisfactorily and a contract was placed for the Trawsfynydd station. Tenders were received for Dungeness and Ministry approval was obtained for this station and also for a 650 MW station at Sizewell.

The problem of energy storage in the reactor core has now been shown experimentally to be less serious than was feared, but dimensional changes in the reactor core during its lifetime are expected to be larger than was anticipated.

The increase of 2,202·5 MW of installed capacity during 1959-60 was accompanied by a rise in boiler evaporative capacity of 16,399·5 klb/hr. Coal consumption rose over the previous year by 4·1% and is expected to continue to rise to between 51 million and 53 million tons by 1965. Siting of power stations becomes a critical problem with such large consumptions and computer techniques are being used to select the best sites. Proposed sites for coal-fired stations are at Holme Pierrepont, West Burton, Cottam and Ratcliffe-on-Soar and a further site at Market Worsop will become suitable if the dry cooling tower proves to be a commercial proposition.

The quality of coal continued to fall during the year and the average calorific value fell from 10,442 to 10,383 B.Th.U./lb. Cost of coal delivered also fell by 5½%, largely as a result of increased generation local to the coalfields. A rise in thermal efficiency to 26·53% was accompanied by a reduction in the average works cost from 0·645d to 0·604d per unit.

All new steam stations are designed for rapid start-up after overnight or weekend shut down. Previous tests on 60 MW sets under these conditions were extended to a 100 MW set at Ferrybridge B during the year. The first 200 MW set with both stator and rotor hydrogen cooled conductors was commissioned at High Marnham and three prototype designs with inner-cooled stator windings, two using water and the other using gas, continued to give satisfactory service. Generators on order or in service with inner-cooled stators now total 5,000 MW.

Successful trials have shown excitation of alternators using an a.c. generator and silicon rectifiers to be satisfactory and a 120 MW prototype machine is being tested.

Developments on cooling equipment include trials on an asbestos-cement packing cooling tower at Staythorpe B and placing of an order for a 147,500 g.p.m. circulating water pump with concrete volute. Although the efficiency of the cooling tower was higher than other towers in service it was less than anticipated, and the trials are proceeding.

Investigations into improving control of plant are concerned with application of new concepts to enable sets to be started quickly and for the operator to be able to take rapid action in an emergency. A trial installation for automatic start-up and control or turbine and boiler plant was put in hand.

Transmission Plant . . .

DURING the year there was a 10·9% extension in total length of grid circuits. By the end of the year reviewed the grid was interconnecting 439 substations with a total transformer capacity of 41,306 MVA. Transformer capacity increased by 13% during the year.

Amongst notable work completed was installation of 132 kV, 90 MVA reactors at Belvedere and Littlebrook and replacement of existing 132 kV circuit-breakers at several points by switches of increased breaking capacity. Some 390 route-miles of 275 kV supergrid were completed during the year and brought into operation. Work put in hand included a further 377 route-miles of double-circuit 275 kV line and 34 transformers for 275 kV working, with a total capacity of 3,710 MVA. Plans for additional work on the supergrid include new points of supply in south-east Suffolk, at Bustleholm, to reinforce supplies in the West Bromwich area, and at Corby. Arrangements have been made to reinsulate one circuit of the High Marnham-Monk Fryston line for 380 kV working.

Schemes for grid extensions approved during the year covered connection of an extra 2,660 MW of generating plant, 1,900 MW to be connected at 275 kV, 760 MW at 132 kV. Eleven new 275 kV substations were approved and 21 new points of supply to area boards were agreed. It is notable that four of these related to supplies to steelworks, some of which will take loads in excess of 100 MW. The fluctuating nature of such loads gives rise to special problems, and so direct connection to 275 kV or 132 kV system will be used to minimise interference with public supply. Four supplies for a 25 kV 50 c/s railway system were approved.

Work on plant design and development included testing of four 2,000 A circuit-breakers designed for 15,000 MVA fault level on the 275 kV system. A similarly rated isolator was tested as well, together with ancillary equipment. Contracts were placed for three 275 kV outdoor substations of a new design, and standard design of indoor substation was completed. Satisfactory experience was obtained with trial installations of high-speed automatic reclosing circuit-breakers at the ends of 275 kV lines. Design work on 380 kV gear was pushed forward, and insulators for both 380 kV and 500 kV were actively considered.

In connection with transformers required for the 380 kV trial line, impulse test levels of 1,425 kV peak and 1,050 kV peak were specified, together with ±15% on-load voltage regulators. Two standard sizes were adopted for 275/33 kV transformers. Under development is a noise-reducing enclosure for 275/132 kV auto-transformers.

Amongst cable developments was use of a "cross-bonding" technique enabling a reduction in conductor section to be made. If service experience is successful, this technique will be applied to 275 kV cables. Major 132 kV cable orders included one for two three-core cables using corrugated aluminium sheath.

Overhead line developments include completion of the double-circuit 275 kV crossing of the River Severn. Subsequently, several faults occurred because of conductor swinging and investigations are proceeding into remedial measures. Design studies were put in hand for a 380 kV four-bundle conductor double-circuit line of high capacity.

During the year there were 614 faults on the transmission system, 93% being cleared automatically and correctly in the best performance since vesting day. Because long clearance times may cause instability on the 275 kV system, high speed protection is being used for backing up, instead of overload protection.

Major design work on the cross-channel converter station at Lydd was completed and work began on site, together with type testing of equipment.

Research . . .

ALL sections of the supply industry are engaged in research, with the CEGB concentrating increasingly on the problems of operating nuclear stations. Many matters associated with performance of fuel elements are under study, and close attention is being given to reducing losses in the heat exchangers used in gas-cooled nuclear power stations. In the field of conventional generating techniques, work on advancing steam temperatures continues to be supported.

Problems of turbine blade vibration are intensified as unit size increases and so are those associated with erosion of exhaust-end blades due to wet steam. Experiments on the first subject are being carried out at Edinburgh University and on the latter by the CEGB directly.

In the transmission field, the accent is on uprating the transmission voltage used in this country, and on more efficient control of the grid system. The extent to which electronic computer techniques may be applied is under close consideration.

In the longer term, the interest is on direct generation of electricity, as exemplified by the fuel cell, thermionic diodes and magnetohydrodynamic techniques.

In the distribution field some of the most promising work concerns cables. Ways of using plastics-insulated cables are under detailed study in a number of trial installations, and parallel with this work there has been much activity aimed at simplifying the jointing of cables. Methods proposed include use of compression joints and of cold sealing compounds. Increased loading of u.g. cables is being studied by the ERA.

Work on single-wire overhead h.v. lines has continued, but it is thought unlikely that the technique will have much application in this country.

Noise from transformers in towns is a matter of concern with the increasing number of substations necessary. Investigations are following a number of different lines, ranging from laboratory studies of the mechanism of noise production within the core of the transformer to field experiments with noise-reducing enclosures, and with transformers having a special form of double-tank construction.

In the field of utilisation research a number of investigations are in hand. Complex regression analysis of grid load curves is being carried out to determine the contribution made to system demand by various classes of consumer, and load recorders installed with 900 domestic consumers in the Midlands and Yorkshire EB's have been used for the same purpose. Another project has covered 150 domestic cookers in the Eastern EB area.

A major project in hand is a full-scale sample survey of some 10,000 commercial consumers. Field work for this was completed during the year, the first comprehensive survey of this class of consumer carried out simultaneously by all the area boards.

Large scale tests have continued of various methods of automatic control for block storage heaters. A study has been started of possible improvement in block heater design generally, with particular reference to Continental practice.

Instrumented tests on floor-warming in flats continued and a market research firm has been commissioned to make a sample survey of some 4,000 domestic consumers, to gather comprehensive information on the way they used space-heating and water-heating appliances.

Electricity aids road safety

MOTORWAY LIGHTING AND ROAD HEATING DISCUSSED

STUDIES of the effect of lighting on accident rates on motorways have been recommended by the Road Research Board of DSIR. In the annual report* of the Board and of the director of the Road Research Station, the Board record their recommendation "in view of the marked effect of improved street lighting on accidents in urban areas and of motorway experience and practice abroad." They say they have recommended the lighting of motorway intersections, and called for experiments to be made on the lighting of motorways throughout their length.

One of the lighting ideas tried out in the context of motorways has been use of car headlamp type lights set on posts only two or three feet high. Tests were made on a runway at Hendon aerodrome, with a layout simulating a three-carriageway road with hard shoulders. Lamps were set at intervals of 50 ft in each of two rows, staggered so that lamps were 25 ft apart along the road.

Low-level Lighting

Two arrangements of lamps were tried. One with the lamps set to illuminate for each driver the side and rear of any vehicles ahead, so that they would appear as bright objects set against a relatively dark road surface. The other arrangement had the lamps set to illuminate the road, so that vehicles were seen in silhouette as dark objects against relatively bright road surface.

The type of headlamp used for the experiments had a wider beam than for normal vehicular headlamps and gave a sharper top cut-off, but it did not prove fully satisfactory. The conclusion from the tests was that results comparable with good conventional lighting could not be achieved.

With the direct illumination arrangement, lamps were mounted three feet high, directed at an angle of 30° to the line of the road, and dipping 2° below the horizontal plane. The variation of illumination proved worrying to drivers, reflections of lamps in the driving mirror impaired vision in it, and moving shadows cast forward by the vehicle were disturbing.

Lamps mounted two feet high were used for the silhouette arrangement, and vertically ribbed glass used to spread the beam. There was less trouble with shutter effect and driving-mirror glare, and moving shadows were barely noticeable. However, vertical surfaces of light-coloured cars appeared brighter than the road surface instead of in silhouette, and when the road surface became wet, much of the effectiveness of the system was lost.

The same arrangement with the lamps set against the traffic overcame these objections, but introduced severe glare. Glare and a general confusion of brightness were also present to an apparently insuperable degree when this arrangement of lighting was used for the difficult case of a slip road entering a motorway.

Conclusions from the test are that to be acceptable a low-level lighting scheme would have to make use of lamps with an upper edge to the beam more sharply defined than on any production lamps at present available.

Road Heating

If road lighting in the interests of safety is one of the earliest contributions of electricity to roadway engineering, heating as an anti-ice precaution is one of the most recent. Several trial installations are now operating and others are planned.

One of the conclusions that has emerged from RRS work on road heating is that the control system governing the energy input must offer something more than sensitivity to temperature alone. A cold dry road surface does not present any hazzard, so response to surface wetness must be built into the control gear. A system devised by the station is operated by detectors in a pilot slab of road, having a specific heat and thermal conductivity such that its temperature changes before that of the road surface itself.

All the road-heating systems so far installed employ embedded cables of some kind. The RRS is working on a simpler system in which an asphalt road surfacing is used, sufficiently electrically conductive to generate heat at outputs of up to 20 W/sq ft. Carbon of suitable form and quality is added to the normal constituents of rolled asphalt.

Experimental Installations

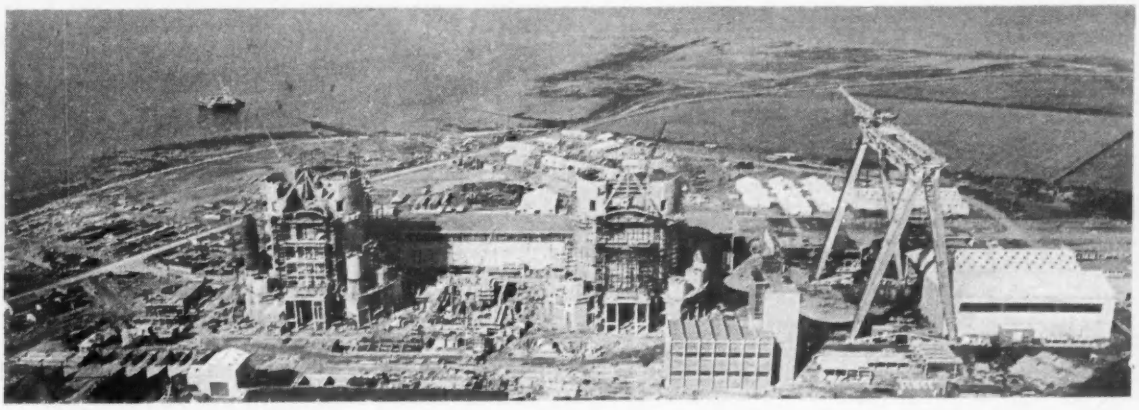
The report refers to four experiments with road heating which are in operation or planned. First comes the full-scale experiment at Uxbridge Road, Slough. This is 750 yd long, and involves heating grids using six different types of cable. Supply is at 240 V, with general heating at 9 W/sq ft stepped up to 12 W/sq ft on a bridge, where there is higher possible heat loss from the underside of the bridge decking.

At the Mound, in Edinburgh, an installation at 15 W/sq ft loading has been carried out in conjunction with the City Council, the SoS EB, and the ERA.

The RRS has collaborated with the City Engineer of Coventry in designing both mains and low voltage heating for exposed ramps to multi-storey car parks. One ramp had 7 W/sq ft loading, and last winter its operation, although in many ways satisfactory, gave a rather low rate of snow melting. The loading was lower than intended, due to the unexpectedly low specific resistance of the expanded-metal reinforcement mesh used as a heating grid.

At the Ace of Spades underpass on the Kingston By-pass, and at Basildon, Essex, the RRS has designed experimental installations. These are intended principally to provide information on the performance of heating grids in the permanently shaded situation along the underpass and on the exposed section of a bridge, where the underside of the deck introduces heat losses likely to exceed those encountered in normal road construction.

Road Research, 1959. Published by HMSO, price 7s.

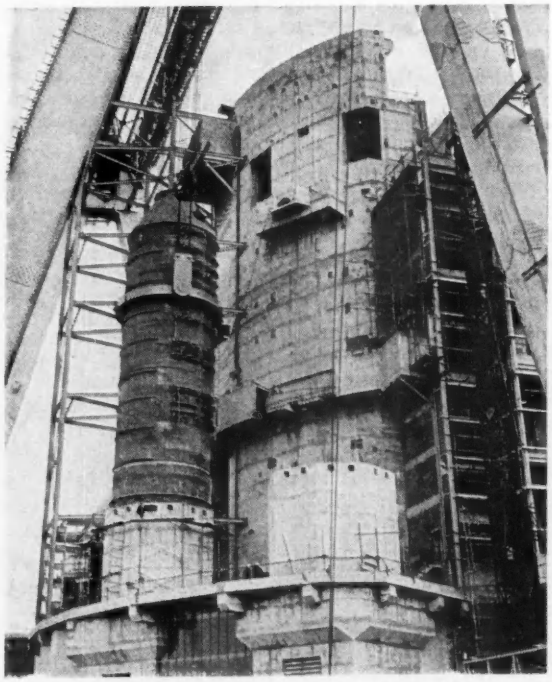


Progress at Hunterston

FIRST STEAM-RAISING UNIT PLACED ON PLINTH

WITH the unhappy period of labour troubles left behind, work is now progressing fast at the 160-acre site of the South of Scotland EB's nuclear power station at Hunterston. The accent is moving from the civil engineering work to mechanical and electrical installation. This was apparent when we visited the site last week as guests of the main contractors, GEC. Present expectations are that the first reactor will commission at the end of 1962.

As the accompanying illustrations show, the outer walls of the two reactors of this 300 MW station are nearly complete. The 3 in. pressure vessel for the first reactor is completely welded, with the heavy support grid that will carry the 2,530 tons of graphite core in position, together with the inner heat shield, which is one of the distinguishing features of the GEC-Simon-Carves design. Final work is being carried out on welding the charge nozzles and control rod nozzles that pass through the pressure vessel to give access to the core; and when this has been completed, the whole structure will be stress-relieved. This is one of the critical operations in construction of the reactor, and it will be carried out by use of internal electric resistance heaters.



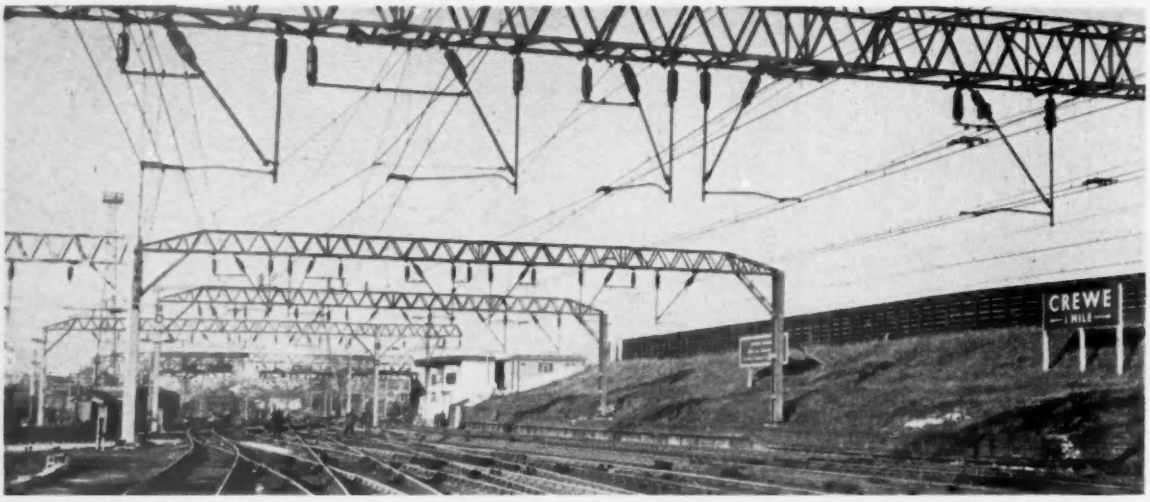
The first steam-raising unit is placed on its plinth by the Goliath crane. High accuracy in positioning is required

After stress-relieving and the detailed work that follows it will come the next big test, a pneumatic pressure check of the reactor vessel at 253 lb/sq in., compared with a working pressure of 150 lb/sq in. It is expected that all this work will be completed in time for the task of laying the graphite core tiles to begin in the summer of 1961.

Outside the reactor biological shield, the most important advance of recent weeks has been successful placing into position of the first steam-raising unit; there will be eight of these for each reactor. High accuracy in positioning is made necessary by the use at Hunterston of centrifugal gas circulators housed in the lower end of the s.r.u., and driven from outside by a shaft passing through the s.r.u. shell. The first s.r.u. was lifted into position by the Goliath crane on 15 September, and preparations for installing steam tubing and the gas circulator are under way. Further s.r.u.'s are now being built on a production basis, with hydraulic testing and cleaning to nuclear standards to be undertaken before they are lifted into position.

The second reactor is due to be operating on load in the autumn of 1963. Concreting the 9 ft thick biological shield has reached an advanced stage, and some of the internal metalwork is in position. Fabrication of the main pressure vessel is taking place in a special construction area, and the bottom courses have already been lifted into position inside the biological shield. A start has been made on fabricating the massive core support grid. All this work is two months ahead of the revised schedule, as a result of experience gained with the first reactor.

Away from the reactor buildings the various ancillary buildings are largely completed externally.



Railway electrification

The 25 kV, 50 c/s system takes shape

FOUR years ago the British Transport Commission adopted 25 kV a.c. as the standard voltage for electrification of the majority of main and suburban lines under their modernisation plan. This year, the first major stages in the scheme are coming into use. The first stage of the Manchester to London scheme was inaugurated on September 12 and this will be followed shortly by electrification in the Glasgow suburbs and the Liverpool Street to Enfield, Chelmsford and Southend lines.

Next week, railway specialists from home and overseas will be able to assess the technical achievements of the railway engineers and those in industry who have contributed to the schemes. For, to implement the electrification programme, the railways have departed from their traditions by sub-contracting the majority of locomotives, line and signalling equipment to industry.

More than 40 papers will be presented at a conference to be held in the Institution of Civil Engineers. The conference will be supported by an exhibition of rolling stock and manufacturers' equipment at Battersea Wharf from 3 to 9 October. (See page 480.)

British Railways' modernisation plan was originally estimated to cost £1,200 million when it was first proposed in December, 1954. About one-third of this estimate was allotted to track and signalling improvements and the structures, rolling stock and locomotives for electrification.

Publication of a Select Committee report on the railways in July this year revealed an increase in the estimated cost of the plan by 34% in the intervening years to £1,660 million. Although the Select Committee was critical of both the way in which the cost of the plan had been estimated and the method used for assessing the increased revenue to be expected, they acknowledged the remarkable increases recorded on recently electrified and dieselised lines. For example, on the Shenfield-Southend line passenger journeys in 1959, the third year after electrification, were nearly three times those of the previous steam services and there was a consequent rise in receipts of nearly 146%.

In the case of the Kent coast scheme, an extension of the Southern Region's third rail system, ticket sales were up by one-third in the first six months of operation, considerably higher than had been anticipated. The Southern Region will continue under the modernisation plan to operate its third rail systems on 650 and 750 V d.c.

The decision to adopt an overhead line system operating at 25 kV a.c. with reduction to 6·6 kV at certain bridges and tunnels was originally estimated to give a £6 million

Fig. 1, above. The electrified approach to Crewe, one of the most congested junctions on the London Midland electrification scheme, is now nearing completion under stage I

Fig. 2. Cab layout of a 3,300 h.p. 25 kV a.c. GEC locomotive which can haul passenger trains at speeds exceeding 100 m.p.h. ▶

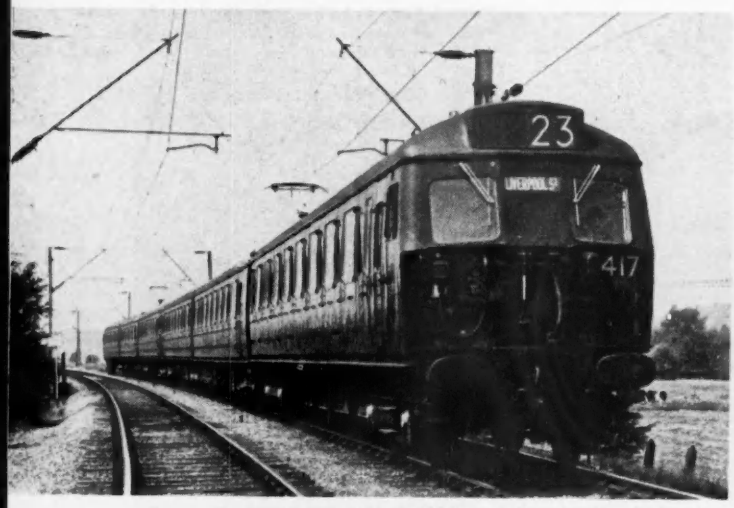


Fig. 3. Trial train with the new GEC stock for the Chingford and Enfield lines, near Hertford, on the Eastern Region

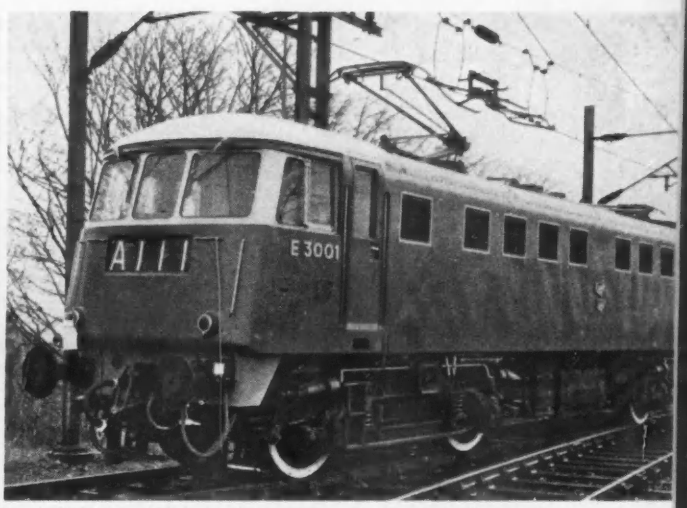


Fig. 4. 3,300 h.p. AEI electric locomotive on the Crewe to Manchester section of the London Midland Region

saving over a 1,500 V d.c. system in a total expenditure of £118 million. Running costs were also expected to be reduced by 8½% per annum. Some of the salient features of the scheme will now be described, with particular reference to the recently completed Manchester-Crewe line.

Electric Locomotives

The electric locomotive has several advantages for long-distance haulage over its steam and diesel counterparts. By drawing its supply from the national grid, very high peak powers are available for rapid acceleration and for developing powers for speeds in excess of 100 m.p.h. Cleanliness is another valuable asset. The steam engine, with its efficiency of little over 5%, requires servicing after only 12 hours' running and an additional service every two weeks. Three steam locomotive changes are normally required on the London to Perth run, whereas an electric locomotive could do the journey for several days without being changed.

From the maintenance aspect, the electric locomotive has the great advantage over the diesel of simplicity in construction, enabling a unit replacement scheme to be operated. The trend on recent designs is to simplify construction still further.

Initially, 100 locomotives have been ordered for the main line between London and Manchester. They are being built by AEI, English Electric and GEC to British Railways' specification.

The locomotives develop 3,300 h.p., weigh 80 tons and have four-wheel bogies. Type "A" locomotives are designed to haul passenger trains at speeds up to 100 m.p.h. Type "B" have a different gear ratio and are intended for passenger haulage at 80 m.p.h. or freight haulage at 55 m.p.h.

The locomotives have driving cabs at each end with the drivers' controls standardised. Power is normally taken from the overhead line by the trailing pantograph of the pair on each car through carbon contact strips. An air-blast circuit-breaker mounted on the recessed roof of the locomotive is designed to open as the locomotive passes between 6·6 and 25 kV sections and to remain open until the appropriate transformer tap-change has been completed. The AEI (Manchester) and GEC locomotives have tap changers on the high voltage side operating under oil. Secondary tap changing has been used on the English Electric and AEI (Rugby) locomotives and also on a series of locomotives built by British Railways but incorporating AEI electrical equipment. To avoid complications in the rectifier auxiliaries and to ensure satisfactory operation under vibration, grid control is not used and all speed control is effected by the transformer tap changers. The majority of rectifiers are mercury-arc units. AEI have used multi-anode construction, while both English Electric and GEC are using liquid-cooled single-anode types. The British Railways locomotives have silicon and germanium semiconductor rectifiers. Semiconductor rectifiers require little auxiliary equipment and, therefore, facilitate maintenance. British Railways are investigating simplification of other parts of the locomotive electrical equipment.

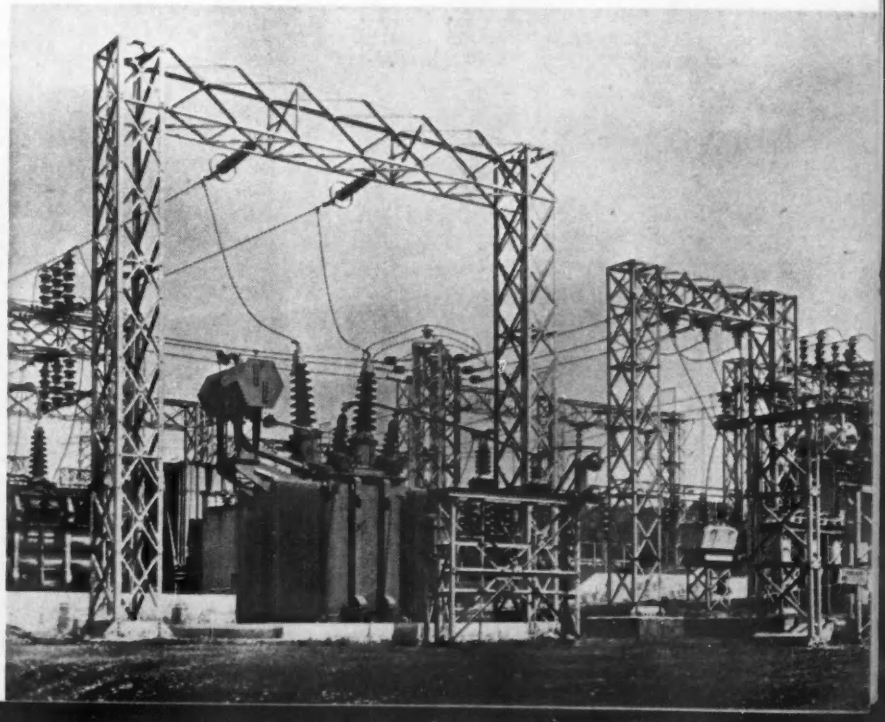
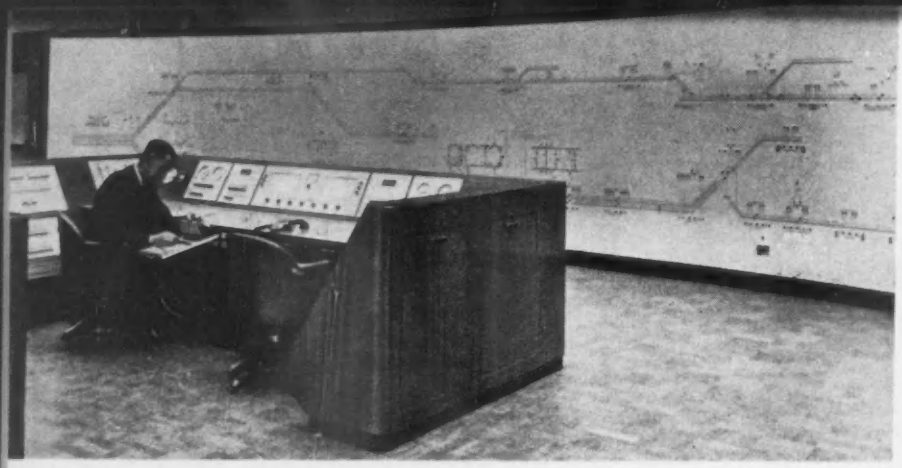


Fig. 5. 5 MVA, 132/25 kV Bruce Peebles transformer at the Strathleven substation of the NSHEB for giving single-phase supply to the Glasgow suburban system ▶



◀ *Fig. 6. The Eastern Region power control room at Romford with equipment supplied by Standard Telephones and Cables*

Seventy-one multiple units are also being equipped for the Eastern Region by GEC.

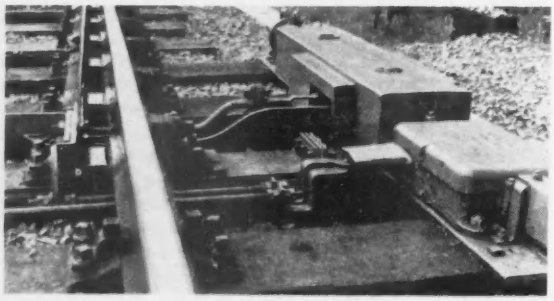
Power Supplies

Power for the 25 kV overhead lines is obtained from the 132 kV CEGB grid. In general, it will be possible to utilise existing grid substations equipped with additional 132/25 kV single-phase transformers. For the London Midland main line there will eventually be 12 feeder points. Two of these, at Crewe and Heaton Norris, are now in use, supplying the Manchester-Crewe stage. On the Eastern Region there already exist 33 kV substations and these will be retained with modified feeding arrangements.

Continuous indication of power consumption and voltage levels, transformer tap change positions, circuit-breaker operation and other functions is presented to the supervisor in the power control rooms. For the recently opened Manchester-Crewe stage the control room is at Crewe. Three further control rooms will be established at Walsall, Rugby and London when the scheme is complete. For the suburban electrification schemes similar control rooms are being designed. The Eastern Region has rooms at Romford and Pitsea. These are equipped by Standard Telephones and Cables. In the Glasgow area, a single control room at Cathcart supervises the electrical loading. Equipment for this control room and also for the one at Crewe was constructed by Automatic Telephone and Electric. Both schemes effect control by pulse trains transmitted over pilot wires to restrict the number of separate circuits required. Provision is made to extend the range of a particular feeder section if a fault should occur on an adjacent section.

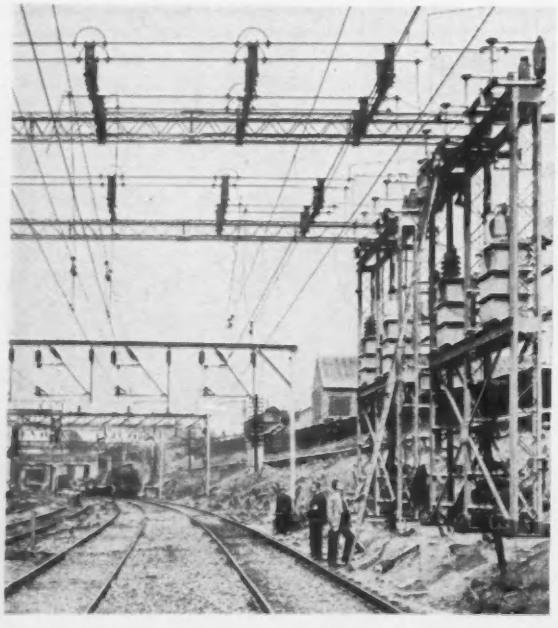
The multiple unit stock for suburban and main line use also incorporates semiconductor rectifiers although a few of the units also have mercury-arc installations. In general, their electrical system is similar to that used in the larger main line locomotives. About 400 of these units are to be brought into service, designed to attain a maximum speed of 75 m.p.h. With the exception of the pantographs and circuit-breakers, all electrical equipment on multiple unit stock is underframe mounted.

AEI have supplied locomotives for the Scottish, London, Midland and Eastern schemes. English Electric are supplying 112 units for the London to Southend line and further units for the Eastern Region lines from Liverpool Street.



▲ *Fig. 7. Electro-pneumatically operated points*

Fig. 8. Booster transformer installation on the Eastern Region. These transformers have a 1:1 ratio and are insulated for 25 kV. Supplied by Fullers, their current rating is 300 A ▼

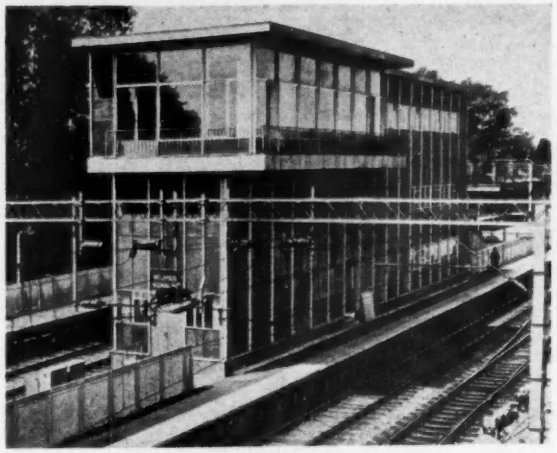


Track and Overhead Equipment

Before overhead equipment for the conductor wires can be installed track modifications, including relaying at curves and reballasting had to be completed. To obtain the necessary clearances of 11 in. for 25 kV and 4 in. for 6·6 kV under bridges and in tunnels, considerable civil engineering work was necessary. On the Manchester-Crewe line, for example, 82 out of a total of 92 bridges had to be raised to give additional headroom. Three tunnels at Stockport Edgeley presented a particularly difficult problem. It was necessary to demolish them to form a cutting and then construct two new bridges, one large enough to accommodate a roundabout at a major road intersection. Although the distance from Crewe to Manchester is only 31 miles, the line covers 117 miles of track. Much of this had to be reballasted and relaid before it was safe for 100 m.p.h. working.

By the end of this year, a further 200 route miles will have been converted to 25 kV a.c., bringing the total route miles of electrified line in the country to 1,318. A further 280 route miles should be completed in 1961. These lengths include the suburban lines in the London and Glasgow areas, which are expected to come into service in the next month or so. By the autumn of next year, it is expected that the Liverpool to Crewe section of the London Midland scheme will be completed, enabling work on the next stage, from Crewe to Birmingham, to be accelerated.

For erection of the overhead equipment over 100 vehicles were made up into working trains. These had to be operated so as to cause as little disruption as possible



◀ *Fig. 9. Exterior of Wilmslow signal box with overhead wiring. This box controls 15 route miles of double track. It supersedes nine mechanical signal boxes*

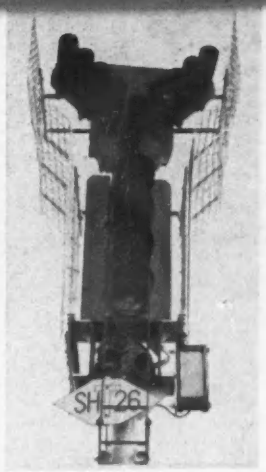


Fig. 10. Westinghouse four aspect colour light signal with direction indicator and subsidiary signal. The high voltage shielding cage can also be seen ▶

to normal services. For the steel supporting structures, holes were drilled by auger borers mounted on wagons. Later, when the structures had been unloaded and positioned from another train, other wagons brought concrete for the foundations. Stringing of the conductors and catenary wires was also carried out from the roofs of special trains.

Signalling and voltage changes from 25 to 6·6 kV on the overhead line require it to be sectionalised at intervals. At these section points both the catenary and conductor wires must be insulated and isolators provided on the adjacent supporting structures. Cables, often with a concentric construction to limit interference, link the feeder points to the overhead system. At intervals along the track, booster transformers are installed with a unity ratio. Primary and secondary windings of these transformers are in series with the overhead wire and track respectively. Their function is to limit stray currents likely to cause signalling or radio and television interference.

Signalling

A complete breakaway from the old mechanical block system of signalling is being used on the modernised lines. Semaphore signals are being replaced by four aspect colour light signals, the addition of a double amber position giving the train driver more precise information on the signals ahead.

Points on the new lines are electro-pneumatically operated and all signalling and track operations in a given area are controlled from satellite automatic boxes. These in turn are controlled by pulse signalling techniques over a single pair of pilot wires from the main signal boxes. Dramatic reductions in the number of signal boxes have been made possible by using modern telecommunications and electronic techniques.

On the Manchester to Crewe line, three boxes now control functions previously requiring 29 mechanical boxes. Each of the boxes has a track indicator diagram which is linked to track circuits. The diagram indicates the precise position of trains in the sections controlled and, in addition, train identifying code numbers are automatically displayed.

In the next two years 100 new power-operated signal boxes will be built, enabling several hundred manual boxes to be closed. In the power boxes, points are controlled by the turn of a switch. Although the switches can be used for individual control of points if required, they can also be set for automatic operation so that track equipment resets automatically after a train has passed through their controlled section. A further refinement is the ability to set up a programme of point and signal settings, operating as many as 100 points by a single switch, an operation which with the old mechanical frames required individual setting, perhaps by several boxes, and was extremely time consuming. To give the train crew close contact with the signal controller, trackside telephones are provided. Telephones also link the various ground frames and maintenance points with the signal boxes.

Finally, mention should be made of the automatic warning system. Warning is given to the train driver through a track circuit using inductors. A similar system is also used to "sense" the change from 25 to 6·6 kV on the overhead line system to operate the tap changers.

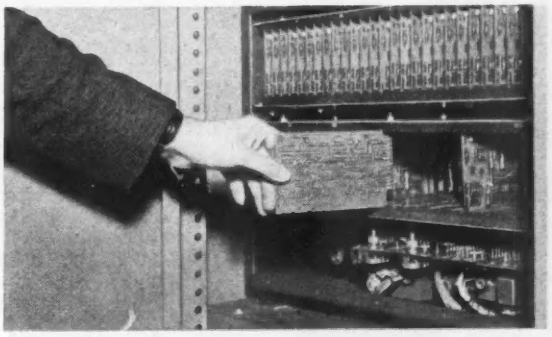


Fig. 11. Transistors and printed circuit techniques, as ▲ *shown by these plug-in panels, are now being widely used in signalling*

Fig. 12. Interior of the signal box at Sandbach. This box controls 12 route miles of track with 53 colour light signals, ▼ *52 electro-pneumatic points and 199 track circuits*

B.R. 25 kV a.c. on display

Fig. 1. Inaugural train on the Manchester-Crewe 25 kV a.c. line, the 12.15 p.m. for the West of England with its special headboard

REPRESENTATIVE equipment of the complete 25 kV electrification scheme will be on show at the Railway Electrification Exhibition to be held at Battersea Wharf from 3 to 9 Oct. The exhibition is being held in conjunction with the conference on railway electrification

The exhibition, organised by the Locomotive and Allied Manufacturers' Association and BEAMA in co-operation with the British Transport Commission, covers 39 stands. The first ten stands are devoted to rolling stock exhibited by British Railways. Six stands show locomotives for the 25 kV system. On stands 7 and 8, British Railways are showing multiple unit stock for the Glasgow suburban scheme and the Eastern Region, while stands 9 and 10 are devoted to bogie units for locomotives and multiple-unit stock.

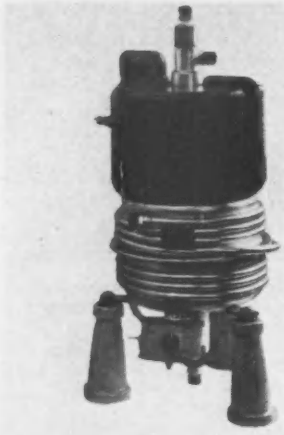


Fig. 2. GEC "Com-Pak" rectifier. Sixteen are used in each 25 kV locomotive

AEI Locomotives

Locomotives on three stands are representative of the AEI contribution to electrification. In the E3001/23 series, E3008 shows the construction developed by AEI, Rugby. The mechanical parts are sub-contracted to the Birmingham Railway Carriage and Wagon Co. This locomotive employs low-tension tap changing. Locomotive E3046 is representative of numbers E3046/55 being constructed by AEI, Manchester. These locomotives employ high-tension tap changing. In contrast to E3056, both the above-mentioned locomotives have mercury-arc rectifiers supplying the traction motors. Type E3056, in the series E3056/95 constructed by British Railways, also has AEI electrical equipment. Semiconductor rectifiers are used in these locomotives, ten having silicon rectifiers and 30 germanium. Another feature of this series is the use of additional rheostatic braking.

An example of the multiple-unit stock under construction by AEI for the Glasgow suburban electrification is shown on stand 7. All traction, heating and lighting equipment is being supplied by AEI, while the mechanical parts are built by the Pressed Steel Co.

AEI Auxiliaries

On a separate stand AEI are showing examples of their electrical equipment. Six-anode mercury-arc rectifiers, three of which are installed on each locomotive, are displayed. They are diametrically connected in parallel so that each tank has three anodes in each half cycle. Four single-anode mercury-arc rectifiers are used on the Glasgow suburban stock. They are of the continuously excited type and are designed for underframe mounting on each train set. Other rectifier equipment includes silicon rectifiers for the BR 25 kV locomotives and germanium rectifiers supplied for conversion of 124 trains from 1,500 V d.c. to 25 kV on the Liverpool St to Southend line.

The traction motor shown, complete with wheel and axle assembly, incorporates the Alsthom flexible drive which reduces the unsprung weight of the locomotive. These motors have a continuous rating of 847 h.p. at 975 V 700 A.

Air-blast circuit-breakers, type TGIH, are shown under simulated operating conditions. These are for roof mounting on the locomotives and motor coaches. Other exhibits include a main transformer with l.t. tap changing unit for the Glasgow suburban line. The unit is divided into two compartments with the transformer in one and the two-way

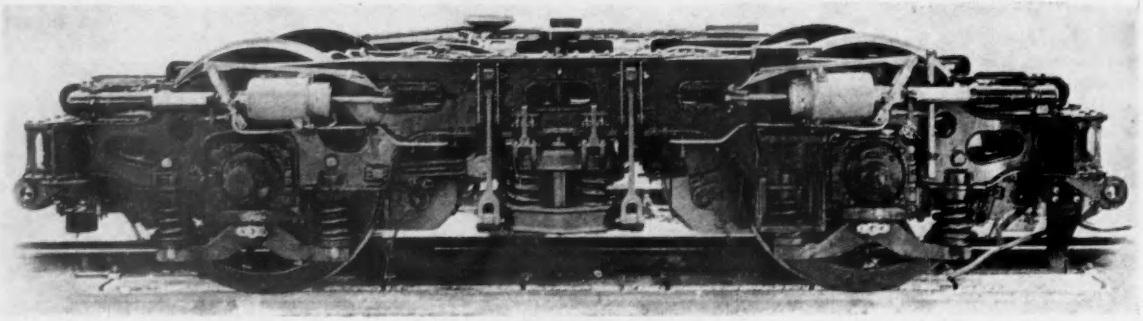


Fig. 3. One of the two bogies for the English Electric 25 kV 3,300 h.p. locomotive

primary change-over switch in the other. Tap-changing cam groups for both suburban and main line locomotives are shown with motion gearbox, driving motor and notching relay.

Signalling is also featured on this stand with examples of the Associated Electrical Industries-GRS d.c.-operated equipment, immunised against effects of a.c. traction. The exhibits include examples of protective equipment and double-rail a.c. track circuit operating on a frequency of 83⅓ c/s.

English Electric Locomotives

For the London to Manchester and Liverpool lines, English Electric are supplying 15-3,300 h.p. locomotives. They are designed to exert a continuous tractive effort with full field of 20,000 lb at 55 m.p.h. The overall length of the locomotive is 50 ft and over half of the total weight of 73 tons is taken by the electrical equipment.

Supply is obtained through one of two pantographs and fed to the transformer winding through an a.b.c.b. and change-over switch. This switch connects the four sections of the primary winding either in series or parallel depending on whether the supply is at 25 or 6·6 kV.

The transformer feeds two, three-wire bridge groups of ignitron mercury-arc rectifiers. Each group feeds two traction motors permanently connected in series. However, the centre point of the motors is connected to the transformer secondary mid-point so that the motors are effectively in parallel. This renders them less sensitive to wheel slip.

In addition to the primary voltage-selector switch, the transformers have secondary tap changers for speed control. Cam-operated contactors select the tappings and electro-pneumatic contactors make and break the circuits. A further stage of speed control is obtained by weakening the traction motor field. In all, there are 40 running notches.

A smoothing reactor in series with each of the four traction motors reduces current ripple and assists commutation.

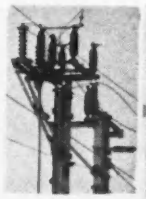
Shell construction is used for the main transformer, which is forced oil cooled. Epoxy resins have been used for terminal insulation and fittings and a specially designed version of the Buchholtz protection relay is fitted to meet traction service conditions.

The ignitrons are water-cooled units, with a stainless steel vacuum vessel. Water is circulated through spiral guides on the surface of the vacuum vessel and also through the cathode block.

The four traction motors are four-pole d.c. machines with class H insulation. Armature and field windings are forced ventilated and a single stage of field weakening is provided by taps.

The locomotive bogies are designed for ease of inspection and maintenance. They include long-range spring gear, swing bolsters and close guiding of wheel and axle sets to ensure good riding. Braking is achieved by independent and proportional air brakes and each wheel has its own brake cylinder. To meet the strength and weight specifications, an unorthodox construction was chosen for the locomotive frame and body. The frame is fabricated as a unit, stress-bearing structure in Cor-tan steel. The underframe is of shallow cellular construction using light-gauge members and the whole is plated top and bottom to form a closed unit.

One of the 15 locomotives supplied on the English Electric contract is being equipped with air-cooled silicon rectifiers and a notchless form of speed control employing transductors.



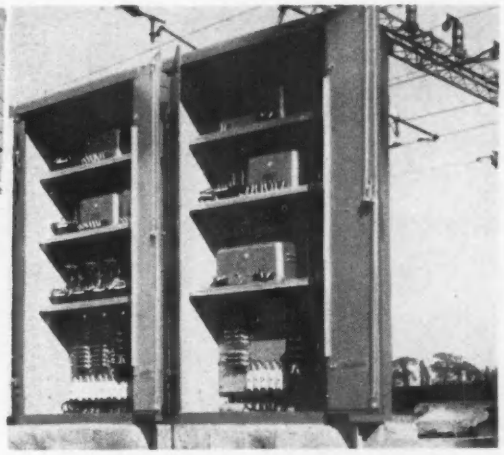


Fig. 4. Section isolator manufactured by Hackbridge and Hewittic. Isolators are mounted on the overhead wire supporting structures

Fig. 5. A Westinghouse track-side cubicle containing feed equipment for the track sectioning

Multiple Stock

Multiple unit stock on display is representative of those supplied for the London to Southend lines. These were first brought into use in 1958. The original stock was equipped with mercury-arc rectifiers, but a further 42 units now on order will be equipped with silicon rectifiers.

On a separate stand English Electric are showing examples of rectifiers including silicon types and transformers for multiple unit trains and locomotives. A locomotive master controller operating in the form of a complete control-desk assembly illustrates working of the controller and cam rig.

Other items include an a.c. electro-pneumatic contactor, an electro-pneumatic reverser, resistor units and fuses.

GEC Locomotives

The third manufacturer supplying locomotives for the main line electrification is GEC. They are building ten locomotives of the type represented by E3042 on British Railways stand 6. The mechanical parts for these locomotives, which are slightly longer and heavier

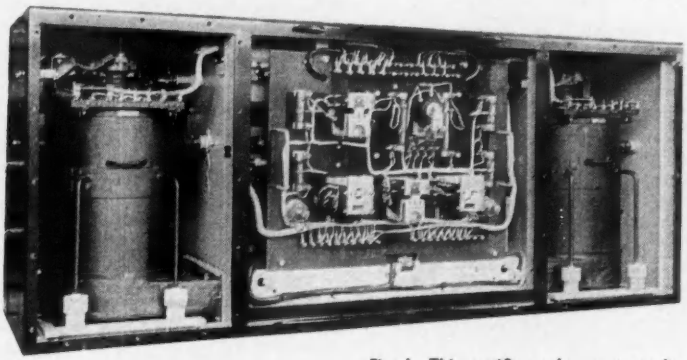


Fig. 6. This rectifier and contactor unit is underslung from the frame of the English Electric multiple unit trains

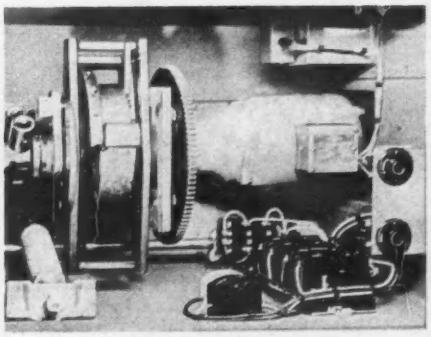


Fig. 7. Interior view of the motor-wound spring mechanism built by Switchgear and Equipment for operating track section isolators

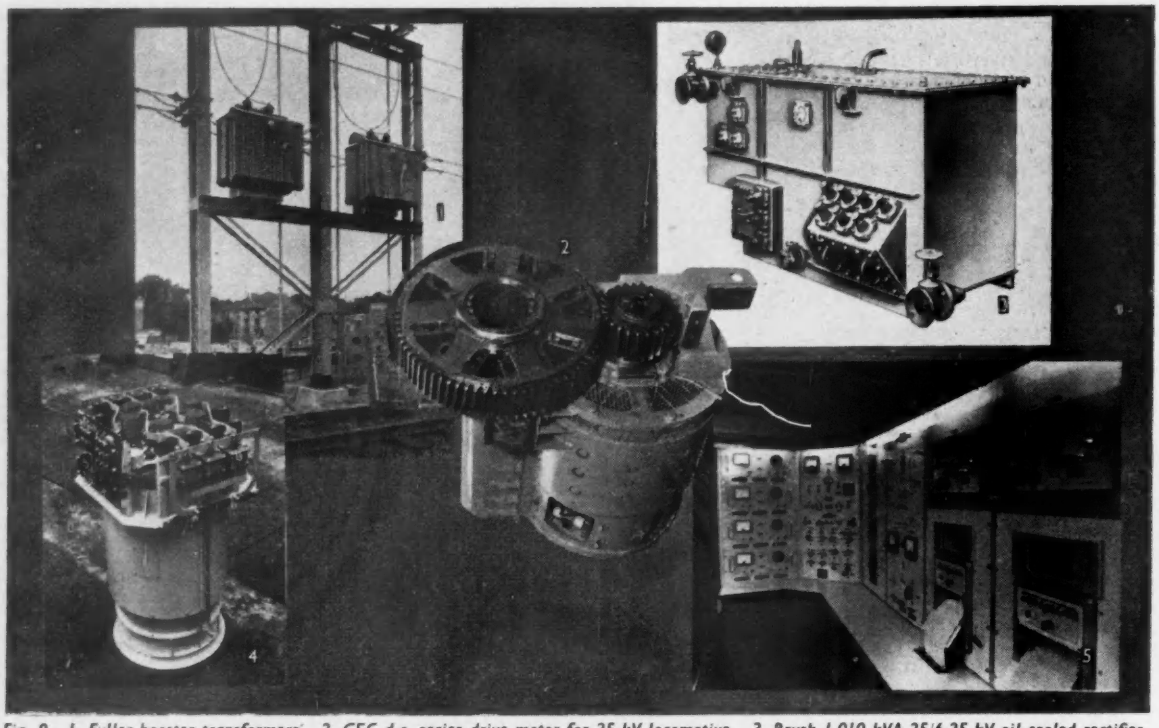


Fig. 8. 1, Fuller booster transformers. 2, GEC d.c. series drive motor for 25 kV locomotive. 3, Brush 1,010 kVA 25/6.25 kV oil-cooled rectifier transformer with electro-pneumatic tap changer for mounting beneath motor coaches. 4, AEI multi-anode air-cooled mercury-arc rectifier as used in the 25 kV a.c. locomotive. 5, View of test panel in the gondola coach developed by BR Midland Region in conjunction with BICC for checking overhead conductor alignment and operation of pantograph

than the English Electric units, were constructed by North British Locomotive Co. They are designed to give the advantages of duplex equipment for, with the exception of the main transformer and its auxiliaries, the two halves of the unit are identical. In an emergency a single motor can be isolated and a complete bogie with its auxiliaries cut out of service.

The current-collection gear is similar to the other locomotives, but the transformer and rectifier arrangement includes some variations. The transformer has a separate tapped regulating winding under the control of the h.v. tap changer, arranged to give 38 steps. A further two steps of field weakening on the motor give a total notch range of 40. The transformer is of the oil-forced cooled type with separate radiator. The transformer has two secondary windings supplying eight "Com-Pak" excitron mercury-arc rectifiers. These are arranged so that each pair of traction motors is fed in a bridge for the reasons previously described. The "Com-Pak" rectifiers have a high power/weight ratio and are liquid cooled.

Each of the four traction motors is fed through an overload-controlled electro-pneumatic contactor and a second contactor. These are used together for isolation. Electro-pneumatic contactors also effect reversing and the two steps of field weakening are obtained by diverter resistors.

The four six-pole motors are insulated with class H insulation throughout and are designed for a 1 hr rating of 890 h.p. at 850 V 1,100 r.p.m. when taking a current of 875 A. They are mounted on the bogie frame through rubber pads and drive through Brown Boveri spring couplings.

Four-wheel bogies of the swing bolster type are used with 8 in. dia air-brake cylinders for each wheel mounted above the axle boxes. Air is provided for the brakes by a motor-driven compressor while two vacuum exhausters maintain the vacuum for the coaches.

The main frame and body are formed entirely of thin steel plate as an integral structure. The base has a shallow box section, curved round and upwards to form the bases for a series of pillars. Corresponding sections of the cant rail curve downwards to form the top junctions of these pillars.

GEC Auxiliaries

As well as the locomotive on display the GEC are also showing a range of components for locomotives, multiple stock and signalling.

They include traction motors, "Com-Pak" rectifiers, transformers with automatic change-over switches and motor-driven tap-changing switches.

Equipment for multiple unit stock on the Liverpool St to Hertford lines includes a 1 MVA oil-cooled main transformer with auxiliary windings for power and lighting. An undercar tap-changer with air operated twin camshaft shown gives voltage control for the traction motors.

Two items being supplied for the majority of rolling stock on BR systems are a heater-jumper plug for 800 V supplies to coach heaters and a 36-point plug for linking traction, braking and auxiliary circuits on multiple coach trains.

Cables on display by Pirelli-General include a 25 kV concentric oil-filled feeder cable, stainless steel sheathed, self-supporting aerial cables and special cables for track circuit connections and telecommunications.

Among the examples of fluorescent lighting equipment for coaches is the prototype of a power-pack silicon controlled inverter and another inverter for the Eastern Region scheme which supplies 12-40 W tubes from a 110 V battery.

The display by the Siemens and General Electric Railway Signal Co. includes single-rail d.c.-fed track circuit with immunised relays and gas discharge surge protectors, single- and double-rail a.c.-fed track circuits and a d.c. searchlight signal. Demonstrations show the effect of injecting 50 c/s a.c. into these systems.

Other Traction Exhibits

Traction motors are also being shown by Crompton Parkinson and Brush. The Crompton motor is of the self-ventilated, axle suspended type with class B insulation. The motor has a continuous rating of 175 h.p. at a speed of 1,620 r.p.m. when taking 190 A at 750 V. It is designed for d.c. or rectified a.c. supplies with ripples up to 30% and it is insulated for 1,500 V d.c. Field weakening is by taps.

The Crompton motor is suitable for use with the 25 kV system of electrification and represents the company's contribution to modernisation which also includes extensive cabling work on the BR system.

The Brush motor is of a similar type, having a 230 h.p. 1 hr rating. Other equipment shown includes a 1,010 kV 25/6·25 kV oil-cooled rectifier transformer for mounting beneath motor-coach underframes. This has an electro-pneumatic high-voltage change-over switch in the transformer tank.

Brush are also showing an air-break, motor-operated cam type, on-load tap-changer for control on the transformer secondary side. A silicon rectifier rated 700 V 1,000 A d.c. at 25 kV a.c. manufactured by Westinghouse is also available for inspection on the Brush stand.

Examples of rheostatic braking resistors are on view on the Expanded Metal Co.'s stand and Thomas Bolton are showing samples of h.c. copper and "Combarloy" used for commutator bars and control gear.

Overhead Equipment

Main contractors for the overhead wiring installation on the Manchester to Crewe line were BICC. The construction work involved 217 track miles and called for provision, excavation and erection of over 3,000 structures. Single-track cantilever arms have been used except where multi-track working required welded rod and lattice steel portal structures. The exhibits show a comprehensive selection of individual components for the overhead structures. They include catenary and contact wires, all types of registration equipment, cantilevers, the latest types of insulation and various types of insulators. A section of track inside the main entrance to the exhibition shows the equipment used and its function. Adjacent to the track is a self-supporting, 55 ft floodlighting tower developed by the BICC group for low-level use in shunting yards.

The BICC display includes also power and telephone cables. Samples of the specially screened aluminium-sheathed telephone cable installed on the London Midland routes are available for inspection, with a demonstration of protection afforded against interference from the traction system by the cable screening. The main cables used on the Manchester to Crewe route had 14-pair carrier quad cables between Crewe and Manchester, together with 104-pair audio quad cables from Crewe, tapering to 54 pairs at Slade Lane junction. Similar installations were provided on other sections. To achieve intrinsic screening, the cables have aluminium sheath for good conductance, with lapped magnetic tapes to increase sheath inductance. A high-quality serving protects both sheaths against corrosion.

Power Cables

The power cables shown by BICC are of the concentric type for 25 kV feeds to the track equipment. They are oil-filled, corrugated aluminium-sheathed cables with fully sectioned sealing end and gas-filled cables with straight-through joints. Examples of aluminium and lead-sheathed cables, rubber and plastics insulated and sheathed supply cables complete the display which also includes a complete assembly of a 25 kV pantograph with end bushing.

A concentric cable for 25 kV feeder duty is also being shown by AEI, Woolwich. This cable has a 0·25 sq in. inner and a 0·21 sq in. outer conductor and central oil duct. The cable is paper-insulated, single-lead sheath reinforced and has an anti-corrosion finish. These cables link CEGB substations to the BR feeder stations on the Manchester to Crewe line and are also being used on the Glasgow suburban system. For these two schemes 36,800 yd of cable were installed by AEI Construction Division.

In addition to the cables, there are examples of 25 kV oil-filled sealing ends and straight-through joints. These may be compared with their solid-type equivalents.

A range of 25 kV cables with sealing ends is also displayed by Enfield Standard. The display also shows grid suspension wiring systems for railway stations and marshalling yards and the "Unyte" system for temporary lighting during maintenance. Display panels illustrate construction work during the company's railway electrification contracts.

Several firms are showing specialised auxiliary equipment for the track and overhead works. Doulton Industrial Porcelains display high-voltage insulators for 25 and 6·25 kV service. They are in three groups, classified according to their mechanical loading. The display also shows a 25 kV circuit-breaker and pantograph support insulators.

Main exhibit on the Hackbridge and Hewittic stand is a single pole 6·25 kV isolating switch controlled by a motor-operated mechanism. A series of springs ensures that the operator cannot switch directly from the "earth" to "on."

The isolator is mounted on the structure spanning the track. Hackbridge and Hewittic have supplied 25 and 6·25 kV isolators for the Eastern Region lines and isolators of a similar

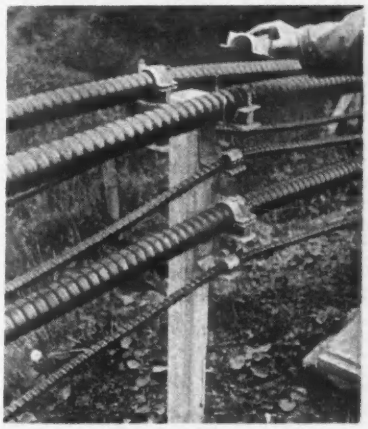


Fig. 9. Method of cleating 33 kV and 25 kV concentric and pilot cables on the Shenfield line, devised by BICC

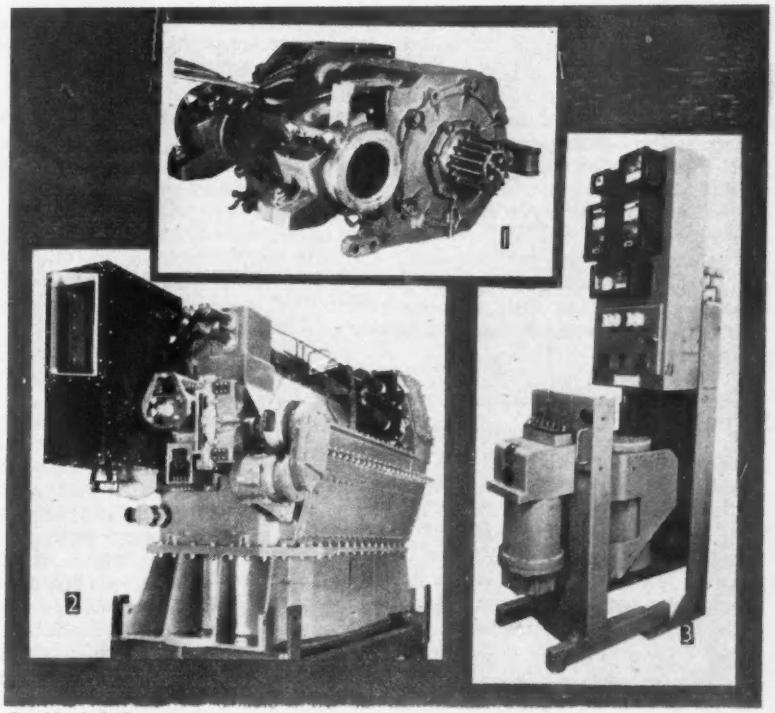


Fig. 10. 1, Self-ventilated, axle-hung Crompton Parkinson traction motor for operation on d.c. or rectified a.c. 2, Tap-changer for the GEC 25 kV locomotive. 3, South Wales Switchgear 6·25 kV oil circuit-breaker of the type used for traction substations

type have been supplied by Bertram Thomas for the Manchester-Crewe and Glasgow schemes.

A 3-position track sectioning isolator, also for overhead mounting, is being shown by Switchgear and Equipment as typical of the large number supplied for electrification. The isolator has a spring driven mechanism, charged by an electric motor.

For the pantograph equipment, Morgan Crucibles are showing samples of their Link MY7D collector strips adopted by British Railways and used for many years by the Netherland Railways. Commutator segments of sintered copper on steel and sintered bearings also feature on this stand.

On the Ferranti stand are shown examples of their clip-on ammeters with ranges up to 500 A and also high voltage testing rods.

The display by Nalder Bros. and Thompson includes their range of single and double moving coil "Edgwise" instruments and also relays for detecting 50 c/s currents on 83⅓ c/s systems.

Transformers and Switchgear

A range of signalling standby and booster transformers is shown by Foster Transformers. Also available for inspection is high voltage test equipment, current transformers and a 2 kA current injection tester for checking c.b. overload coils.

The core and windings of booster transformers installed to reduce telecommunication interference by stray return currents are shown by Fullers who also have on view oil minimum, 25 kV, air-insulated circuit-breakers of the type supplied to the Eastern Region.

Transformers of the type supplied for the Glasgow suburban scheme are shown by Bruce Peebles. This firm have manufacturing facilities for many aspects of railway electrification.

Turning to switchgear, three firms are concentrating on this aspect of electrification. Switchgear and Cowans are showing two o.c.b. rated 27·5 kV, 330 MVA and 6·9 kV, 165 MVA. The breakers are totally enclosed in sectionalised compartments and have compact design. A 6·25 kV o.c.b. is also featured on the South Wales Switchgear stand together with a 3-position 1-phase oil-switch.

Switchboards incorporating o.c.b., fuse switches and busbar chambers are featured by Ottermill with their range of busbar trunking which includes the 100 A miniature version.

Principal exhibit by J. Stone is the Stone Faiveley pantograph for mounting on locomotives and multiple unit stock. Reyrolle are showing a recently introduced air-blast circuit-breaker for mounting on the top of coaches adjacent to the pantograph.

Signalling and Control

Central attraction on the Westinghouse stand is a model railway showing examples of signalling techniques applicable to the a.c. electrification scheme. Other exhibits illustrate the company's work in the brake and rectifier fields.

Equipment for signalling, power control and other aspects of supervision are being shown by Standard Telephones and Cables and Communication Systems.

Progress in communications

EVERY three years the Post Office Research Station at Dollis Hill opens its doors to the Press and technical experts and allows them to see what has been going on in the fields of telecommunication. While the first and principal interest of the 1,350 scientists and engineers who are engaged there is the improvement of Post Office telecommunication services, they are also actively assisting in allied fields of electronic development such as missile control, monitoring signals from bodies in orbit—both transmitted and reflected—the transmission and monitoring of standard frequency and time signals, etc. In this they assist, and are assisted by, commercial companies in Britain, their opposite numbers in other countries and Government-sponsored organisations throughout the world.

Signals from U.S.

As an example, during the visit last week, time signals transmitted from the USA were being monitored as well as those from the British station at Rugby, the signals from each source being regulated by crystal-controlled clocks of extreme accuracy. The British signals were currently being monitored in the US and the radiated signals from both stations are being used throughout the world for navigational purposes.

The biggest problem facing the GPO today is the provision of more and better telephone facilities. Part of the answer lies in electronic, as distinct from electro-mechanical, exchange equipment, but each stage of development has to be weighed against economic considerations. No doubt an electronic exchange could have been a technical possibility many years ago, but at prohibitive cost. Transistors have contributed to development in one aspect; a more significant contribution is the development of a technique whereby each telephone line can now be made to transmit, without crosstalk or interference, up to as many as 100 conversations simultaneously. The technique arises from a study whereby the words spoken by a talker are sampled, the time-increment samples being converted into a spectrographic representation. The increments are then resynthesised at the far end of the line into a continuous speech pattern in much the same way as a succession of pictures is presented to give an impression of continuous motion in the cinema and on the TV screen.

The increments are carried in pulse form at 10 kc/s frequency in groups of 100, every hundredth one being a further sample of the same talker's speech. Synchronised selective apparatus at each end ensures that only one of the 100 channels is in use between the two subscribers, the remaining channels being simultaneously paired between other subscribers on the common line. The technique also necessitates complementary developments of ringing, metering of calls, advising callers of engaged lines and interconnection between exchanges both of the electronic and non-electronic type. Most of these problems have now been solved and the equipment is in an advanced state of resolution. The first electronic exchange to incorporate these developments will be Highgate Wood, but even this will only be partially transistorised. When the fully transistorised system is introduced the power demand will be cut back considerably, and already the problem of a less extravagant form of calling than the telephone bell is being investigated.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Subway Contract

Local reports that the Metropolitan Toronto Transportation Commission was considering the purchase of subway cars from Japan have brought prompt protests from representatives of Canada's electrical manufacturers. It seems that a Japanese firm has submitted a low tender to provide $40 million worth of subway cars for Toronto's University to Bloor system and the Commissioners have been considering a visit to the Japanese works. Mr B. N. Simpson, of the Canadian Electrical Manufacturers' Association, while drawing attention to Canada's increasing unemployment figures, has pointed out that an order for subway cars would include a considerable amount of electrical equipment. "There are firms in Canada quite capable of providing the cars and electrical equipment of equal or better quality than any in the world," he maintained. The existing section of the Toronto subway, inaugurated in March, 1954, has British vehicles. Approval for the next section—to run from east to west across the city—was given four years later.

BERMUDA

Expansion Plans

The Bermuda Electric Light Co. expects to spend over £1 million on development plans over the next two years. This includes the purchase of a 6,000 kW diesel generating set scheduled for delivery next May, Mr L. Vorley, the general manager, has explained. About £400,000 is to be spent on new substations, switchgear and cables. An additional £300,000 is to be spent on normal development schemes, for the company is planning to build three new 22 kV substations. During 1959 the company sold 73·2 million units, an increase of 13·4%, and revenue increased by 11·5% to £1,436,682, providing a profit of £286,473 compared with £226,779 in the previous 12 months.

BRAZIL

H.E. Project

Plans for a 300,000 h.p. hydro-electric project on the River Passo Fundo, some 50 km from Erechin, have now been submitted to Brazil's Comissao Estadual de Energia Eletrica by Electroconsult, of Italy. The latter consulting organisation was specially engaged for the purpose. The project is considered an important one in the Rio Grande do Sul electricity expansion programme, but no decision on the matter has yet been announced.

FINLAND

Power Imports

Faced with a shortage of power output because of the abnormally dry weather in the past year or so, Finland is proposing to import electricity from Russia. Finland's State-owned power concern, Imatran Voima, has undertaken negotiations arranging for the supply of up to 200 million units annually for ten years starting on 1 Jan., 1961. The power imports are primarily intended for the woodworking concern, Emso-Gutzeit, which has mills near the eastern border.

MIDDLE EAST

Transport Problem

An earlier decision to replace the Beirut tramways by petrol-driven buses has now been superseded. A Commission which was set up to consider the matter has recommended conversion to electric trolley-buses. But the Lebanon Government already has a major problem with the electricity generating plant which, even now, is insufficient to meet all demands and it was to alleviate the position that petrol-driven vehicles were suggested. The Commission have even considered the possibility of using battery-driven buses. The matter still remains open and a foreign expert has been asked for advice on the whole question of public transport in Beirut.

Loco Loan

To finance the purchase of 100 electric locomotives, spare parts and tools from the USA the US Export-Import Bank has granted a credit of $22½ million to the United Arab Republic.

GHANA

Volta Tenders

The contract for construction of the Volta River hydro-electric scheme is expected to be awarded next April, the Ghana Government has announced. Tenders are being invited from suitable firms and a meeting is to be held in Zurich on 6 Dec. at which those concerns who wish to tender can obtain any information required.

INDIA–PAKISTAN

Indus River Treaty

Providing for the largest programme of its kind ever undertaken anywhere in the world, the Indus Waters Treaty was signed last week, after nine years of negotiations. The treaty was signed in Karachi by Mr Nehru, for India, and Field-Marshal Mohammed Ayub Khan, for Pakistan. Simultaneously, an international financial agreement was also executed by representatives of the Governments of Australia, Canada, Germany, New Zealand, Pakistan, UK, USA and of the World Bank to create an Indus Basin Development Fund of nearly $900 million to finance construction of irrigation and other works in Pakistan. Of that sum, $640 million is being provided by the participating Governments, plus $174 million payable by India under the Treaty, and a $80 million World Bank loan to Pakistan. Contribution of the UK to the Fund will be £20,860,000. Annual flow of the Indus and its five main tributaries is twice that of the Nile and, apart from permitting substantial irrigation development, the plan provides for development of important hydro-electric potential in both India and Pakistan. Total cost of the programme is estimated at $1,070 million, of which $870 million is for work in Pakistan and $200 million on work in India. For the former country, power stations will be installed at a dam on the Jhelum River with a capacity of over 300 MW. For India, the plan includes construction of a dam on the Beas River, forming a 5½ million acre ft reservoir and a hydro-electric potential of 200 MW.

SINGAPORE

New Station?

The Singapore Government has plans for the construction of a further power station. This is in addition to the replacement plant at St. James power station and the additional 25 MW set proposed for Pasir Panjang. At the St. James power station, six 6,000 kW free-piston engines have been installed and the first was officially commissioned some weeks ago. But with the demand for electricity rapidly increasing, plans must soon be completed for the additional plant. It is understood that the new station would have four stages, with a 60 MW set installed in each.

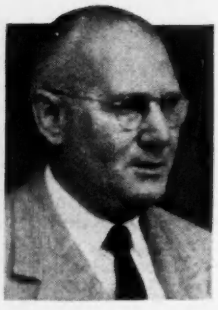
Personalities *in the industry*

Mr J. C. King

Mr J. C. Rivett

Mr G. A. Smith

Mr A. G. Herring



Mr H. Haigh

At last Thursday's board meeting of Morphy-Richards Ltd., **Mr F. P. Bishop,** the chairman, and **Mr D. L. T. Oppé** tendered their resignations from the board of directors, which were accepted. **Sir Joseph Lockwood,** chairman of Electric and Musical Industries, and **Mr J. E. Wall,** financial director of that concern, have joined the M-R board, Sir Joseph being the new chairman. Morphy-Richards is now a subsidiary of EMI and it will be recalled that Mr F. P. Bishop and Mr D. L. T. Oppé are two of the three directors who opposed the EMI takeover bid which was sparked off by the disposal by Mr D. W. Morphy of most of his holdings. The third opposing director, Mr C. F. Richards, founder of the business with Mr Morphy, remains on the M-R board.

Two new appointments have been made in the English Electric Co.'s Aircraft Equipment Division which is centred at Bradford and supplies generating and associated equipment to military and civil aircraft. **Mr J. C. King,** M.SC.(ENG.), A.M.I.MECH.E., A.F.R.AE.S., is appointed manager, Aircraft Equipment Division of the company, in which post he is responsible for the engineering, servicing and commercial activities of the Division. **Mr J. C. Rivett,** B.SC.(ENG.), M.I.E.E., who has been chief engineer of the Division since 1955, will now also be its deputy manager. These appointments are consequent on the transfer, reported last week, of Mr P. J. Daglish, formerly manager of the Division, to D. Napier and Son Ltd. as a special executive. Mr King, who is 41, has worked in the aircraft industry since he graduated at the City and Guilds College, London, in 1940. For the next five years he was a structural test engineer with the RAE at Farnborough. He joined the English Electric Co.'s aircraft division at Preston in Sept., 1945, again as a structural test engineer. Since that time he has successively held posts on the engineering and administrative staffs with the Division at Warton, when he was responsible for development work on the Canberra and Lightning, and was later concerned with administration for technical personnel and the provision of capital facilities. In 1957 Mr King was transferred to London as assistant director of engineering, where his duties were to improve the effectiveness of the technical manpower employed on research and development in all branches of the company's engineering work, and to control centrally the activities of the Mechanical Engineering Laboratories. He remained with the Directorate of Engineering until his present appointment as manager of Aircraft Equipment Division. Mr Rivett has been chief engineer of the latter Division since 1955. He has been closely associated with the development and manufacture of a wide range of electrical equipment for many types of British and American aircraft, and also with the introduction to Britain of constant frequency a.c. electrical systems. He now also holds the position of deputy manager to the Aircraft Equipment Division. Before he joined English Electric, Mr Rivett was assistant general manager of the aircraft electrical division of the Plessey Co. Educated at King's College, London University, where he graduated in 1938, he then completed an engineering apprenticeship with Metropolitan-Vickers Electrical Co. Ltd., at Trafford Park.

Formerly commercial manager of Wilkins and Mitchell Ltd., **Mr K. H. Ward** has joined the Quicktho Engineering Co. Ltd., and appointed joint managing director as from 1 Oct.

Mr G. A. Smith has been appointed commercial executive of the Electronic and Equipment Group of the Plessey Co. Ltd. This group includes the Telecommunications, Electronics and the Domestic Equipment Divisions and Hagan Controls Ltd. In this appointment he will be responsible for the co-ordination of the four sales organisations within the group. Mr Smith was until recently general manager of the Telecommunications Division and, prior to that, was with Plessey International Ltd., responsible for overseas sales of electronic equipment. Before joining Plessey's in 1957, he was for ten years with the Telecommunications Division of Pye Ltd. Originally a development engineer, successive promotions resulted in his appointment as export manager.

Mr A. G. Herring has been appointed to the board of Brookhirst Igranic Ltd., a company in the Metal Industries group. Mr Herring, who was born in Manchester in 1898, was educated at Manchester Grammar School. He joined the Igranic company in 1929, became an area manager in 1946 and was made general manager of the Chester factory of Brookhirst Igranic earlier this year.

Lord Chandos, chairman of Associated Electrical Industries, left London last Thursday on a visit to Canada. In Western Canada he will see the site of the main dam on the Peace River power development scheme, with which AEI have been connected since its inception. He will also meet representatives of AEI (Canada) in Toronto.

Purchasing officer of the North Eastern Electricity Board since its inception, **Mr Harry Haigh,** M.I.E.E., is to retire very shortly, although he is only 62 (*ESH, page 149). He remains in very good health and plans to enjoy more golf. Prior to 1948, Mr Haigh was borough electrical engineer at Middlesbrough for 13 years—taking over that position at the age of 36. Educated at Belle Vue School, Bradford, he served an apprenticeship with the Borough of Morecambe electricity department. Whilst he was mains superintendent there the town's system was changed over from d.c. (vulcanised bitumen cables laid solid and drawn into conduits) to a.c. with a distribution system on up-to-date lines. He also saw the birth of the autumn illuminations there which developed into the annual feature. In 1926 he went to Gainsborough as engineer and manager,

* *Denotes revision to the "Electricity Supply Handbook, 1960."*

after five years in that post and was appointed electrical engineer and manager to the Shipley UDC. He went to Middlesbrough as chief in 1935.

Mr R. J. Meldrum has been appointed export manager of Belling and Lee Ltd. in succession to **Mr J. E. Bailey,** who has left the company. Mr Meldrum joined Belling-Lee in Jan., 1957, as technical representative in the industrial field, after three years' service in the RAF as technical officer. Prior to that he was with EMI Engineering Developments Ltd.

Mr Ted Westfall has been elected a vice-president of International Telephone and Telegraph Corporation, with effect from 1 Oct.

Mr R. Barber has resigned his position as director and secretary of the British Steel Founders' Association in order to take up an appointment in industry. **Mr John Bolton,** at present secretary of the British Steel Castings Research Association, has been appointed to succeed him from 1 Oct.

Mr C. Adams has resigned from the board of Sydney S. Bird and Sons.

Mr D. H. Whiteley, Mr C. W. Whiteley and **Mr J. H. Whiteley** have been appointed to the board of B. S. and W. Whiteley Ltd.

The Minister of Power has reappointed **Alderman P. W. Barnes** and **Mr R. Farquharson** as part-time members of the Southern Electricity Board. **Councillor Major E. K. Turnour of Groes** has been appointed to the vacant deputy chairmanship of the Merseyside and North Wales Electricity Consultative Council (*ESH, page 176).

Mr W. M. H. Stevens, A.M.I.MECH.E., M.S.A.E., has been appointed deputy chairman and joint managing director of Firth Cleveland Pumps Ltd. Mr Stevens was formerly technical director of Bowser International Ltd. **Mr R. W. Hill** continues as joint managing director and will control sales activities from the Firth Cleveland group headquarters.

Miss Lesley Souter, B.SC., A.R.T.C., A.M.I.E.E., and **Miss Rosina Winslade,** M.S.I.T., are now in Russia on a fortnight's study of the training, employment and prospects of women engineers in the USSR. The visit is undertaken under an award by the Caroline Haslett Memorial Trust (General Section). Their plans cover two main centres, Moscow and Kharkov, with visits to various educational establishments and production factories. Two days will be spent in Leningrad.

The Midlands Electricity Board announces the appointment of **Mr C. H. Pettifer,** A.M.I.E.E., district engineer of its Stafford District, as manager of the District, in succession to **Mr J. G. Kellie,** M.ENG., M.I.E.E., who retired on 31 Aug. (*ESH, page 122.) Mr Pettifer, who is 45, holds a British Institute of Management diploma in management studies. Educated at Ealing, he received his general training with the Metropolitan Electric Supply Co. Ltd. In 1936 he joined the drawing office staff of the British Electric Transformer Co. at Hayes, Middx, and in 1938 became senior draughtsman and assistant in the technical office of Central London Electricity Ltd. In 1940 Mr Pettifer moved to Stafford as senior transformer draughtsman to the English Electric Co. Ltd., returning to London in 1943 to take up a war-time appointment as assistant mechanical and electrical engineer in the Air Ministry Works Directorate. In 1946 he returned to Stafford as first assistant district engineer for the Stafford Corporation Electricity Department, and when the supply industry was nationalised in 1948 he took up a similar appointment in the Stafford district of the Midlands Electricity Board. In 1950 he was appointed district commercial engineer at Stafford and in 1953 district engineer.

Mr O. A. Pallett, M.P.O.A., for many years Supervisor of Purchases for the British Thomson-Houston Co., now AEI (Rugby) Ltd., has retired after 48 years' service. Mr Pallett had been acting as a consultant since January of this year, when he was succeeded as Supervisor of Purchases by Mr L. C. J. Carvill. Mr Pallett was educated at King Edward VI Grammar School, Nuneaton, and joined BTH in November, 1912, in the Coventry Works Order Department. After war service he returned to the Coventry Works, becoming head of the Order Department in 1930. The following year he was appointed head of Order and Stores Department and served in this capacity until July, 1945, when he moved to Rugby as Supervisor of Purchases of the BTH Group of Companies. In addition he became Chairman of the AEI Group Purchasing Committee. Mr Pallett is also a vice-president of the Purchasing Officers' Association and a founder member of the Coventry branch.

Previously senior assistant engineer (planning) in the Croydon and West Kent sub-area of the South Eastern Electricity Board. **Mr F. J. B. Thomas,** B.SC.(ENG.), A.M.I.E.E., has been appointed planning and development engineer in No. 1 (Southall) sub-area of the Southern Electricity Board. He takes up his new duties on 1 Oct. Earlier, Mr Thomas held appointments with Central London Electricity Ltd. and the North Western Electricity Board. He was educated at Newbury Grammar School, and continued his studies at Faraday Hse, where he obtained his Diploma.

Arrangements have been made by the Council of the IEE for a memorial service to the late **Sir Arthur Fleming,** C.B.E., to be held at 12 noon on 4 Oct. at the Queen's Chapel of the Savoy.

OBITUARY

Mr George Archer, C.M.G., chairman of Henry Wiggin and Co. Ltd. since July, 1959, and president of the parent concern, Mond Nickel Co. Ltd., died on 20 Sept., aged 64. He joined the board of Mond Nickel in 1948, became sales director in 1952 and managing director in 1955. Earlier, he was with the Raw Materials Dept. of the Ministry of Supply, joining the Ministry's Mission in Washington in 1941. Soon after the formation, in 1942, of the British Raw Materials Mission, he was appointed secretary general, and became head of the Mission in 1945.

Mr E. T. W. Barnes, A.M.I.E.(AUST.), A.M.I.PROD.E., manager of manufacturing, AEI Electronic Apparatus Division, New Parks, Leicester, died on 19 Sept., aged 54. He was assistant engineer with the New South Wales Government Railways for three years before joining the Metropolitan-Vickers Electrical Co., Manchester, now AEI (Manchester) Ltd., as a college apprentice in 1930. On completing his apprenticeship he was continuously engaged on the manufacturing side, including two years at Valpercy dispersal works during the war and, in 1948, became assistant superintendent of the Instrument and Meter Department. In 1953 he was appointed superintendent, Radio Department, and in 1957 took over the additional responsibility of Leonard Wks, under the title of superintendent, Electronics Department and Leonard Wks. On the formation of the AEI Electronic Apparatus Division in 1959, he was appointed divisional manufacturing manager and moved to Leicester.

Mr W. N. Coulson, Leicester area superintendent of the AEI Lamp and Lighting Co., has died, aged 52. He started his career as a lamp sales representative in the BTH Leicester depot and was appointed manager in 1940, a position he held until 1955.

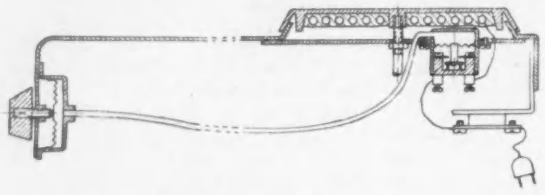
At the reception marking the setting up of the new ERA organisation (referred to on page 499): left, Mr R. Baldwin, Mr A. N. Irens and Dr H. G. Taylor in discussion: on the right, Mr O. W. Humphreys, Chairman of the Council, talks with Sir Leslie Gamage.

PROGRESS IN PATENTS

SELECTED SPECIFICATIONS

Thermostat or Energy Regulator?

There is a fundamental difference between a thermostat and an "energy regulator" as applied to electrical cooking appliances, in that the former depends for its operation on the actual temperature attained in or on the heating zone, whereas the latter performs a simple cycling function—in which the on and off periods are mutually adjustable—independent of the heating zone. The operating mechanism of the cycling switch may be a thermal element or a small motor and, as many cooker designers have discovered, there is a considerable amount of know-how in matching the characteristics of an energy regulator and the loading of a hotplate if satisfactory operation is to be achieved.



A new thermostat design for cooker hotplates

The device which is described in patent specification 848,863, ascribed to Busch-Jaeger Durner Metallwerke Aktiengesellschaft of Ludenscheid, Westphalia, Germany, strikes an intermediate course in that it can act as an energy regulator when applied to a hotplate and as a thermostat when applied to an oven. Briefly, it comprises a liquid-filled capsule coupled by capillary tubes to a pair of expansion vessels in which the liquid is contained by diaphragms. One vessel incorporates a switch operated by movement of the diaphragm; the other contains a means of adjusting the depression of the diaphragm, thereby acting as a remote hydraulic link for adjustment of the setting of the switch.

Used as a thermostat in an oven it differs from the conventional form of capillary thermostat in that the adjustment is on the moving, rather than the fixed, contacts. Used as an energy regulator for a hotplate, it borrows the heat for operation by radiation from the underside of the hotplate so automatically compensating for differing rates of heating up according to the conductivity and quantity of the superimposed cooking utensil and contents. The degree of regulation is, however, not likely to be as close as with a thermostat, nor is it necessary. An additional merit of the design is that the hotplate can be removed for cleaning or replacement without disturbing the regulator. In the form shown the switch is adjacent to the hotplate.

Better Alkaline Batteries

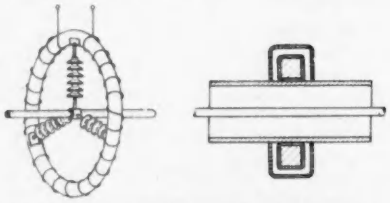
Secondary batteries continue in application, and two in particular, lead acid and nickel-iron or nickel-cadmium, between them account for more than 95% of the installations, large and small, in the world today. Over the years, the improvements in construction have been in degree rather than in any major factor of design but, *in toto*, the advances have been by no means insignificant.

A weakness of the nickel-cadmium cell is the tendency to a reduction in charge acceptance with repeated charge-discharge cycles with a corresponding fall in discharge rates, a condition which is sometimes referred to as "sleepiness." Another shortcoming is a tendency to lose capacity on a first recharge after some months of open circuit. Both conditions can be rectified by a short period of charging at excess rates and it has been suggested that this phenomenon may be due to oxidation of the cadmium negative plate by oxygen evolved in early stages of charge or trapped in a sealed cell.

Patent specification 848,922, in the name of Chloride Electrical Storage Co. of London, claims that the co-precipitation of cobalt hydroxide with the nickel hydroxide in the positive plate—the process is explained—not only increases charge acceptance in the initial stages but also reduces the loss in capacity through storage and combats inherent sleepiness. In regard to the latter it is stated that, whereas the capacity of a sealed cell fell by about 20% during the first 30 cycles, the similar cell incorporating cobalt fell only by 3%. Moreover, the pressure in the cell during charge was only about a quarter of that in a normal cell.

High Voltage Current Transformers

Patent specifications covering current transformer design are not very frequent these days, possibly because nearly



A novel feature of this e.h.t. current transformer design is the insulating material core for the secondary winding

every avenue of design and development has been well explored. An unusual feature of the design which is described in specification 849,182, by Aktiengesellschaft Brown Boveri of Switzerland, is that the core of the circumscribing straight-through transformer is of insulating material. The current in the secondary winding, though proportional to that in the primary, is backed by small v.a. output; consequently, it requires amplification by a device with high input impedance.

The device is intended for application to e.h.t. lines and two of the arrangements are shown here. In a third, three transformers, with rectangular cores, are mounted side by side in a framework with the three phases which form the primary windings passing through them. The arrangement shown on the right above incorporates an external metal shielding to protect the secondary winding from arcing on a flashover.

In one part of the specification, the alternative of adopting conventional gapped iron cores is also suggested.

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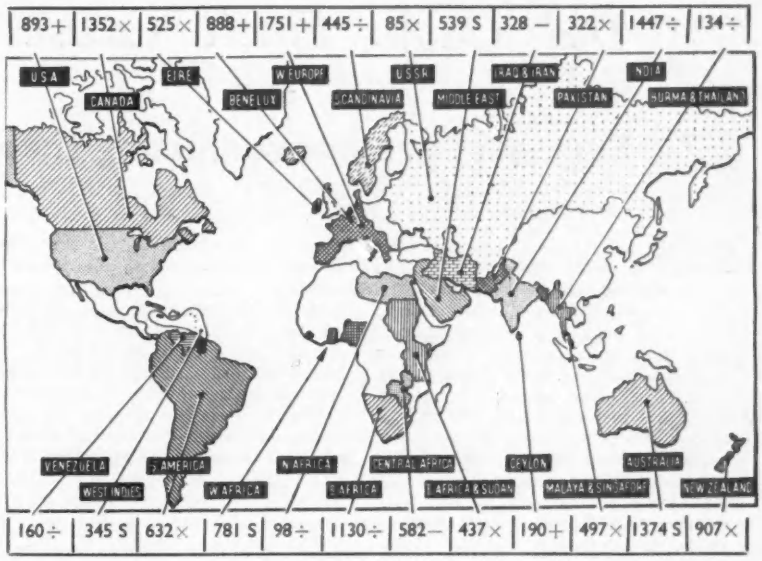
Distribution of Exports in £'000's Sterling

×=over 25% increase
+=10% to 25% increase
S=10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures.



EXPORTS IMPORTS

August

DESPITE the Bank-holiday period, exports of electrical goods last month were over £240,000 up on the July total—an indication of a welcome improvement, much of which was in respect of heavy plant exports. Noteworthy was the figure for switchgear up to 660 V 200 A—£687,301—almost double that of the previous month, but transformer exports declined once again.

Cables also showed an improvement, most of which was in respect of thermoplastic insulated types and winding wires, but exports of wiring accessories showed a sharp drop compared with a year ago.

In the domestic appliance sphere, the total for the month is over £360,000 down on that for July, but refrigerators and washing machines maintain a steady proportion of the goods sent abroad.

Although India's imports of electrical equipment were considerably below those of a year ago, she still remained our best customer for the month, with a total of £1,447,000, Australia following with £1,374,000 and Canada with £1,353,000, of which £286,000 was for generators and motors and £119,738 for cables. Among the South American countries, exports to the Argentine Republic alone amounted to £442,868 for the month.

On the import side the total is about £26,000 down on the July figure and it will be noted that refrigerator imports have again dropped considerably.

Description	Exports Value (£)		Imports Value (£)	
	Aug. 1959	Aug. 1960	Aug. 1959	Aug. 1960
Generators				
Diesel up to 200 kW	373,320	408,782		
Diesel over 200 kW	185,281	266,307		
Steam turbine driven	51,849	19,309		
Water and gas turbines	610,519	429,508		
With i.c. and other prime movers	16,712	18,850	48,304	128,999
Generators up to 200 kW	109,439	100,719		
Generators over 200 kW	95,267	23,941		
Generator parts	825,501	733,103		
Motors, f.h.p.	216,262	247,337		
Motors 1-250 h.p.	388,560	449,490	95,907	160,162
Other motors	371,349	306,565		
Motor starters and controllers	360,916	228,936		
Convertors and rectifiers	217,901	156,754	102,574	174,611
Transformers	542,606	409,304		
Switchgear, to 200A, mv	437,490	687,301	82,094	127,142
Switchgear, other	1,091,853	860,126		
Total, Electrical Plant	*5,894,925*	*5,346,332*		
Batteries, primary and parts	489,557	516,790		
Lamps filament, over 28 V	72,817	95,380		
Lamps filament, under 28 V	24,647	20,997		
Fluorescent and other lamps	91,287	81,388		
Radio and electronic gear	3,487,316	3,543,261	1,369,376	1,586,579
Telephone and telegraphic equipment	1,823,502	1,527,812		
Cookers	37,271	34,558		
Toasters	14,689	11,854		
Other cooking appliances and parts	143,432	115,301	121,316	209,943
Space heaters	20,511	36,598		
Water heaters	27,306	22,717		
Other heaters and parts	94,161	115,208		
Electric irons	85,188	57,095		
Vacuum cleaners	119,180	154,853		
Floor polishers	70,428	63,045		
Food mixers	27,372	42,740		
Washing machines, domestic	233,791	391,251		
Dryers		30,059		
Washing machine and dryer parts	92,856	162,838		
Domestic refrigerators and parts	566,244	770,749	343,299	132,277
Other appliances and parts	222,639	289,336		
Total, Domestic Appliances	*1,765,068*	*2,298,202*		
Portable power tools	214,731	266,227		
Arc welding plant	63,035	94,416		
Resistance welding plant	17,120	22,175	61,343	41,226
Electric furnaces	66,684	54,966		
Signalling apparatus	177,131	113,589		
Commercial instruments	155,686	203,982		
House service meters	139,588	114,567	116,535	493,488
Wiring accessories	239,995	189,644		
Fans	103,137	134,874		
Lighting fittings and lanterns	310,268	332,501		
Other lighting equipment	91,376	80,707		
Telephone and telegraph cable	253,815	323,465		
Paper insulated cables	286,266	402,696		
Rubber insulated cables	240,339	211,602		
Thermoplastic insulated cables	217,856	393,712		
Winding and similar wires	70,412	166,170		
Other cables and wires	143,754	204,075		
Total, all cables and wires	*1,212,442*	*1,701,720*		
Accumulators and parts	294,104	334,664		
Insulating materials	144,214	196,930		
Electrical ware	75,600	153,823		
Industrial electronic control gear	94,351	105,960		
Permanent magnets	39,591	69,139		
All other articles	2,349,156	2,953,795	1,276,699	1,957,124
Total	19,427,228	20,543,841	3,535,353	5,021,551

Did Cable Fault Cause Fire?

Engineers present conflicting theories

SHARP disagreement between electrical engineers about how the fire started which killed 11 people at a Liverpool store was apparent at the resumed inquest last week. The outstanding technical point of contention has been whether a fault in a cable caused arcing, or the cable was damaged by an external fire, to bring it into the state in which it was found. The cable concerned was a 0·06 in. p.i.l.c.s.w.a. cable feeding from a first-floor distribution board to a fourth-floor board.

The arcing theory was advanced by Mr D. A. Picken, HM Electrical Inspector of Factories, who said he had been asked to investigate the source of the outbreak. The cable in question was protected by a 160 amp h.r.c. fuse, the rating appropriate for the cable. There was overload and earth-leakage tripping on the incoming circuit-breaker ultimately feeding the cable.

One Theory

When the cable was examined, it was found that only the phase conductor was damaged. Some 5 in. was missing, whereas the neutral core showed very slight arcing. The armouring was only slightly affected, and that on the inside, by some material that had attached itself by spluttering while molten. Mr Picken said he thought the damage could only have been caused by arcing taking place within the lead sheath; and he thought this was the cause of the fire starting. The protecting fuse had operated in a way that, on examination, indicated a moderately high overload current, about 1,000 amp, which he considered consistent with arcing taking place.

Mr Picken referred to tests in which he said that similar damage was caused to a similar cable operating with a similar protective system, and he said that the crackling sound some witnesses had referred to was produced during these tests. He thought the sequence of events was: the fault occurred, it had started the fire, the conductor had parted, the lights fed by the cable had gone out, the arc continued, the fuse blew, and then the circuit-breaker opened. Flow of current from the fault to earth would cause a rise of voltage on the armouring, due to earth circuit impedance, and this could account for arcing marks observed on nearby m.i.c.c. cables. An external fire, tests suggested, would have to continue for 10 to 15 minutes adjacent to a cable before damaging it.

The fault was in any case unlikely, but he was inclined to think that excessively sharp bending of the cable was the original cause of the fault. He thought it must have been bent to much less than the recommended radius at some stage, possibly to as little as 4 in. radius.

Mr Picken was sharply cross-examined on his theory. He indicated that he thought the armouring ballooned out during arcing. Eventually the hessian burnt, and after that it was possible for hot particles to pass through and ignite nearby material. On the question of earthing, he suggested that the IEE Regulation recommended that a.c. testing of the earth-continuity path should be used if possible; to which counsel disagreed.

The opposing theory about the fire was developed by the sole partner in the firm of consultants involved, Sloan and Lloyd Barnes, of Liverpool.

The partner, Mr L. G. Grant, said that when he was shown the cable in dispute, after the fire, set up in skeleton form on a board the core was intact and the other was in two pieces with a gap of 1½ in. between them. He said he considered that no arcing took place where the gap was. He had examined the fuse protecting the circuit and, by its condition, he judged that the current causing it to operate had been 3,500 amp, which would cause operation in half a cycle or less. He had carried out tests in which he found he could produce gaps like that in the cable in two ways in a copper conductor; by a fracture or by a fusion gap. He showed pieces of cable which he said had been subjected to the heat of a brazier and had developed gaps. His theory was that the fire had burnt the gap in the cable core. Further, he thought that an arc did not make the sort of noise ("like paper rustling") which some witnesses said they had heard.

Continuing his evidence, he said he had examined a great deal of cable at the store, and most of the lead had gone and usually the insulation.

Test Records

Referring to tests of cables carried out by Manweb he said that the cables had to be badly maltreated to produce arcing. Mr Grant was vigorously cross-examined about his own tests and theory. He said he could not produce records of tests his firm had carried out on installations at the stores; it was not customary to keep such records. He considered that the IEE regulations stated no preference as to whether d.c. or a.c. tests should be applied to an a.c. circuit.

Describing his tests with heated cable, he said there was about 6 lb pull on the cable while it was being heated in a brazier. One core parted after 60 minutes, and the test was then stopped.

Questioned about IEE recommendations that where cable ducts or trunking pass through floors or parts of ceilings, the hole should be made good with cement or similar fire-resisting material, Mr Grant said he thought the recommendation of cement was a bad one. On cable bends, he said he rejected the conclusion others had reached that the cable had been bent round a very small radius. He also said that if the course of events had been as suggested by Mr Picken, flickering of lights on the fourth floor would have been noticed.

Two fuse experts gave evidence after Mr Grant. One was Mr F. Bentley, of Dorman and Smith, who said he estimated that a current of 1,000 amp had blown the fuse. That a current of about 1,000 amp had flowed in bursts of fractions of a second for ten seconds total fusing time was compatible with the state of the fuse after blowing. He was followed by Mr E. Jacks (English Electric Co.), who said he estimated that a current of 800 amp had caused the fuse to blow; this was based on his knowledge of fuses of slightly different design. The fuse seemed to him to be perfectly well manufactured.

Disagreement

A Dr J. L. Miller, a consulting engineer, previously with Ferranti and BICC, said he thought the cable was damaged by an external fire. He was present when Mr Grant carried out his test. He said he did not know whether the damage to the cable in the store was caused before the fuse went.

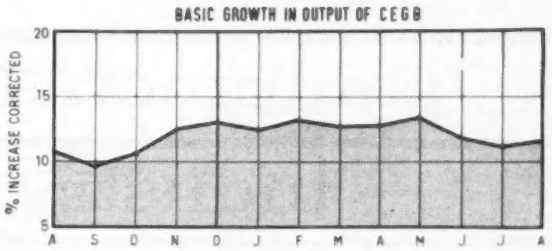
Dr Miller said that tests arranged by Mr Picken involved gross maltreatment of the cables. Cross-examined, he said that Mr Picken's theory could be right, but he (Dr Miller) had a firm belief that the cable was burnt by the fire after the fire had been started. He emphasised the "might." He said the cable had fallen during the fire at the stores, otherwise both conductors would have been burnt through.

Mr G. E. Bowman, described as a fuse expert, estimated that the fuse protecting the cable had operated at a current of 3,600 amp, and at a current of not less than 3,000 amp. He based this on the number and type of breaks in the element. Mr H. G. Bell, of Manchester also gave evidence, saying that he thought the theory of a cable fault brought about by bending "complete and absolute rubbish."

After the evidence, and that of a former Home Office scientist supporting the views of Mr Picken, the Deputy City Coroner began his summing up. The result of the inquest we hope to report next week.

POWER SUPPLY

Statistics for August



SUBSTANTIAL increases in the number of units sent out to consumers are reported by the majority of area boards for the month of August. The Yorkshire Board leads with 22·6% but the Midland industrial areas also show increases exceeding 20% on the corresponding period in 1959. Only the direct supplies have remained at the fairly low rate of increase of 8·1%.

The increases reflect bad weather conditions during the month which are also shown in the national load growth figure of 18·4%. However, when corrected for normal weather conditions and number of working days, the growth comes into line with the previous months at 11·5%.

The South of Scotland Electricity Board commissioned the third set at Kincardine during the month. This is a 120 MW Parson turbo-alternator supplied with steam by an 860 klb/hr John Brown boiler. The station, which is designed for an ultimate capacity of 760 MW, is to be officially opened by Her Majesty the Queen on the 12 October. No new plant commissioning is reported by the CEGB, but the North of Scotland Hydro Electric Board have brought into service a small 540 kW AEI (formerly MV) alternator driven by a Gilbert Gilkes and Gordon water turbine. Decommissioning of a 900 kW set at Rothesay is also reported by the Board.

The new set at Kincardine is the main reason for increased output capacity of the three Boards during August by 123 MW to 28,570 MW. The corresponding figure for August 1959 was 26,869 MW showing an increase of 6·3%.

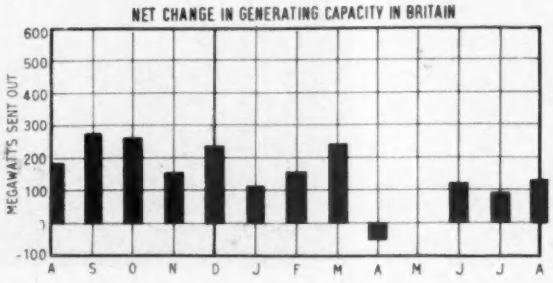
Electricity sent out by the three Boards in August totalled 7,502 million units. The total generated was 7,992 million units, a figure which includes 10 million units generated other than by steam or water power. Of this total, 7,411 million units were generated by the CEGB and 136 and 445 million units by the NSHEB and SSEB respectively.

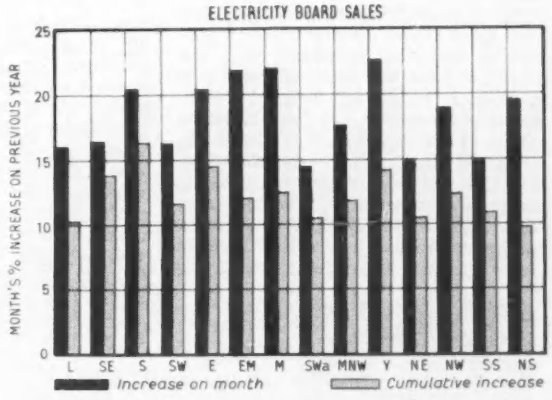
Coal consumption by the three Boards showed a marked increase of 18·3% over August last year. Consumption of coke and breeze fell by over a quarter but this represents only about 1·6% of the total solid fuel consumption. Oil consumption also rose by 16·9% to 353·8 thousand tons.

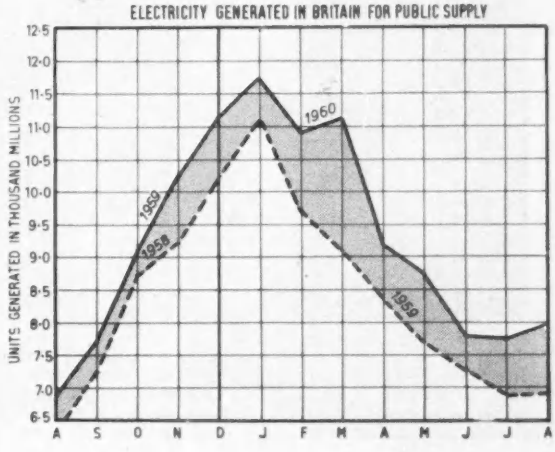
Electricity Board Sales Progress in August

Board	Electricity sent out in millions of units	% increase on Aug. 1959
London	525·7	15·9
South Eastern	401·4	16·3
Southern	556·3	20·4
South Western	274·3	16·2
Eastern	661·2	20·3
East Midlands	576·1	21·7
Midlands	705·3	21·9
South Wales	424·6	14·4
Merseyside and N. Wales	461·7	17·6
Yorkshire	758·5	22·6
North Eastern	422·8	15·0
North Western	769·9	18·7
Direct Supplies by CEGB	316·6	8·1
CEGB Total	6,854·4	18·4
South of Scotland	541·3	14·9
North of Scotland	123·5	19·6

Table excludes area board purchases from other sources.







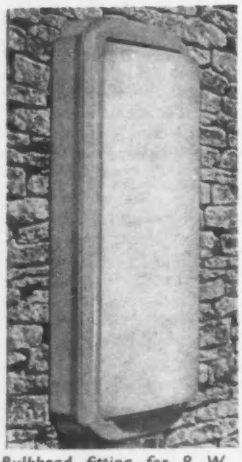
equipment for industry

PTFE-coated glass-fabric

PRODUCED by coating woven glass fabric with polytetrafluorethylene, a versatile new material is available under the trade name "Tygaflor." The material possesses good electrical insulating properties, having a nominal dielectric constant of 2·6 combined with a dielectric strength of 700 V/mil, short time. In addition, it is mechanically strong and will also withstand a temperature range of −100°C to 250°C without structural deterioration while remaining inert to many chemicals including acids and hydrocarbon compounds. Normally manufactured in sheet or tape form in thicknesses between 0·003 in. and 0·01 in., "Tygaflor" is expected to find useful electrical applications. *Fothergill and Harvey Ltd., Harvester Hse, Peter St, Manchester 2.*

Bulkhead fluorescent fitting

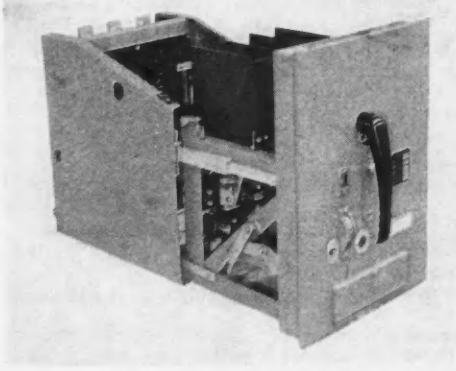
TWO design features to simplify and speed maintenance are incorporated in the new AEI bulkhead fitting suitable for fluorescent tubes. The fitting is a compact, sturdy unit designed for all-weather protection against corrosion likely to be experienced in dockyards, industrial premises and other locations. The fittings can be supplied to house one, two or three 12 in. 8 W fluorescent tubes. Two of these tubes give a light output comparable with a 60 W tungsten lamp, yet their life is five times as long. A special feature is hinges which enable the stippled Perspex cover and its cast aluminium support ring to be quickly and simply removed from the die-cast aluminium alloy base of the fitting. Immediate access to the control gear mounted behind the reflector assembly is achieved by semi-circular clips. Half a turn of these clips releases the reflector, of Bonderised sheet metal finished in white epoxy resin stoved enamel. The fitting measures $6\frac{3}{16}$ in. by $15\frac{5}{16}$ in., weighs $6\frac{1}{2}$ lb and has three cable entries. The metal parts are finished in hammer grey stoved enamel. Moisture and dust ingress is prevented by a neoprene gasket. *AEI Radio and Electronic Components Division, 38-39 Upper Thames St, E.C.4*



Bulkhead fitting for 8 W fluorescent tubes by AEI. The fitting is weatherproof and incorporates quick release attachments for the Perspex cover and reflector

Modified air-break c.b. range

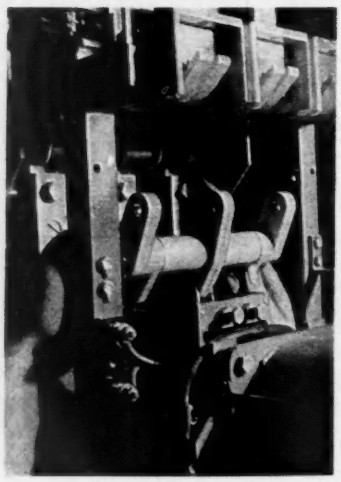
THE range of 660 V air-break circuit-breakers made by J. G. Statter is now available in five versions from 600 A to 3,000 A. These breakers are available for either back- or front-panel mounting, horizontal draw-out or metal enclosure panels. All these breakers are rated for short-circuit conditions of 31 MVA symmetrical at 415 V. The breakers include three-stage contacts, main moving contacts comprising silver copper bridges, secondary arcing contacts and final arcing contacts with carefully designed arc chutes and barriers. The breakers are normally supplied with silicone fluid-filled dashpot time lags. Auxiliary switches can be fitted if required. A feature of the 600 A breaker is the use of Rockite d.m.c. mouldings. These mouldings are used for the base of each breaker and also for the operating links. Their use enables greater clearances to be obtained between live parts and earth, while the strength of Rockite is sufficient to bear the full thrust of closing the breaker against peak short-circuit currents of 110 kA. By redesigning the breaker with the Rockite mouldings, the short-circuit test duty of this breaker has been brought into line with the four other breakers in the series. *J. G. Statter and Co. Ltd., Amersham Common, Bucks.*



Statter have recently increased their range of isolatable air-break circuit-breakers to include a 3,000 A version. A typical unit in the range, of the withdrawable type, is shown above. In the redesigned 600 A version Rockite insulation has been used for the insulation links

Multi-pin connectors

NEW ranges of multi-pin connectors have recently been introduced by the Plessey Co. The aluminium Mk 5 has current ratings up to 60 A with a maximum contact resistance of 2 milli ohms. It consists of a specially strengthened one-piece moulding of silicone rubber designed to maintain a sealing pressure of up to 20 lb/sq in. between temperatures of −40°C and +155°C. Internal gaskets improve electrical performance and allow alternative moulding positions. Twelve different contact arrangements are available and all contacts are silver plated. The second series of multi-pin connectors are the aluminium Mk 6. These are available in four shell sizes with either a plug or socket and may be easily converted to coupler units. The silicone rubber moulding is bonded to the housing, forming an insulator which shrouds each individual contact, cable joint and a portion of the cable dielectric. These connectors are suitable for current ratings from 5 A to 12 A with temperature range from −55°C to +155°C. They are rated for 1 kV at ground level and have an insulation resistance between contact and earth greater than 10^5 megohms at 500 V. A feature of the connectors is bayonet couplings which enable them to be used in four alternative positions. This feature prevents miscoupling to wrong units and also mismating. *The Plessey Co. Ltd., Ilford, Essex.*



for the electrical trade

Heater for greenhouses

A FAN heater recently introduced is designed especially for installation in certain types of greenhouse. The cylindrically shaped unit, "Duo-Flow Turbo," emits horizontal streams of air from the two ends of its casing. A central motor drives two fans, the resulting flow in opposite directions providing a warm-air circulation said to be ideal for maintaining the longer type of greenhouse at an even temperature. Heat is produced by two 1½ kW elements, one being placed behind each circular end grille. An R24 rod type thermostat unit can be supplied with the heater if required. Price £24. No purchase tax applies. *McAllan Appliances, Trojan Wks, 35 Kentish Town Rd, N.W.1.*

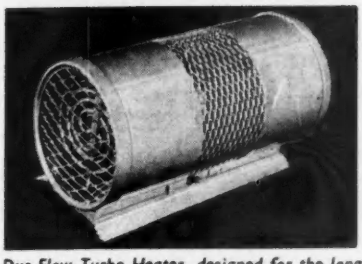
Smaller flashbulbs—same exposure

REDUCTIONS in size have not affected exposure values of two "Photoflux" flashbulbs and their prices, too, remain the same. Type PFI/97 is superseded by PFI/B, actual size now being only 16 mm instead of 23mm. PFI has been similarly reduced in size, but its light output is increased to correspond with PFI/B, though with no virtual effect upon exposures. These improvements have been made possible by the use of zirconium and increased pressure oxygen, giving maximum light with minimum weight. *Philips Electrical, Century Hse, Shaftesbury Ave, W.C.2.*

A really fast kettle

THE fastest electric kettle on the market—that is the claim made by Hotpoint for their new "Hi-Speed" three-pint kettle. Heated by a 2·6 kW element, it boils a pint of water in 94 sec and a full capacity in 4 min 10 sec.

This kettle is the fifth in a range of models ranging from 1 kW rating. It sells at the same price as the earlier 2·3 kW "Hi-Speed," but has a deeper body and slightly larger flanged knob on its lid. The copper tubular element incorporates type B self-resetting automatic cut-out. The new kettle is finished in high quality chromium plate and fitted with a red or black handle and feet which will not mark polished surfaces. It complies with BS 1671:1951. Catalogue No. 3QD. It sells at £4 18s 6d tax paid, 2s more than the three lowest-rated versions. *AEI-Hotpoint, 33 Grosvenor Pl, S.W.1.*



Duo-Flow Turbo Heater, designed for the long greenhouse £24, no purchase tax

▲ *Hotpoint's Hi-Speed kettle. It's claimed to be the fastest on the market. £4 18s 6d*

TRADE PUBLICATIONS

LITESOLD.—14-page booklet and price-list of precision soldering instruments. Light Soldering Developments, 28 Sydenham Rd, Croydon.

POST.—Sales and Promotion News bulletin from Prestcold. Pressed Steel Co., Cowley, Oxford.

APPRENTICESHIP.—A 17-page booklet on the training of apprentices by Negretti and Zambra, 122 Regent St, W.1.

EDISWAN.—Technical leaflets XA702 and 703. Germanium NPN Junction Type Switching Transistor, Tentative. First entitled Stored base charge measurement; the second, dimensions and connections. AEI Ltd., Radio and Electronic Components Division.

DBD.—Small folder leaflet listing specialised electrical equipment, such as aircraft generators, h.f. alternators, power units for radar, radio, etc., from Newton Brothers (Derby) Ltd., Alfreton Rd, Derby.

DECCA.—Technical folder on a radar tape recorder. Decca Radar Ltd., Albert Embankment, S.E.11.

LDA.—A four-page leaflet on the use of lead in batteries. Lead Development Association, 18 Adam St, W.C.2.

MAZDA.—Small booklet/price list with colourful illustrations of fairy lights and other decoration sets with hints on their uses entitled "Go Gay With Mazda." AEI Lamp and Lighting Co., Melton Rd, Leicester.

Inexpensive hand dryer

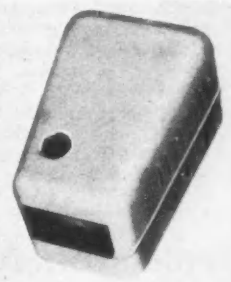
AN electric hand dryer designed to meet the needs of the smaller-staffed establishment has been introduced by Metway at £8 19s 9d. Known as "Dryway," it comprises a motor, fan and heater unit within a narrow case only 7½ in. long and weighs 3 lb. The fan blows warm air through a grille when a red button switch is pressed, cutting off automatically after 60 sec. The unit is protected from accidental overheating by the normal cut-out device which operates upon failure of the fan mechanism, or obstruction of air outlet.

The a.c./d.c. motor is designed to run for 300 hours without service and a spare set of carbon brushes and springs are supplied with the unit. Fixing holes are provided for wall installation and the unit has entries for both back or top cables. Finish is white stove enamel. Dimensions 7½ in. by 5 in. by 4½ in. Total rating 700 W. Catalogue No. DA8199. *Metway Electrical Industries, Canning St, Brighton 7.*

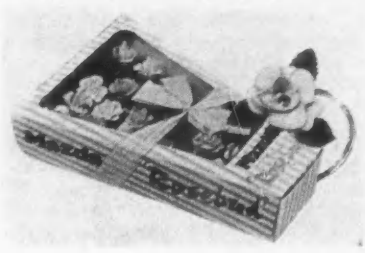
Lights for Christmas

WITH Christmas in mind AEI have announced the latest inclusions in their range of Mazda fairy lights and decorative sets, "Rosebuds" and "Tom Thumb Candles." The former consists of strings of vari-coloured roses with jewel lamps in the heart of each "bloom." The set of 20, supplied in an attractive window-topped box is priced £2 5s 6d tax paid. "Tom Thumb Candles," also sold in sets of 20, are miniature coloured lights mounted as "flames" on small candles. They sell at £1 9s including purchase tax. These new fairy lights extend a large range of similar sets suitable for all occasions, they are illustrated and described in AEI's booklet "Let's Go Gay With Mazda." *AEI Lamp and Lighting Co., Melton Rd, Leicester.*

A hand dryer for the small firm. 7½ in. long. Price £8 19s 9d ▶



AEI's "Rosebud" set of illuminated flowers, price £2 5s 6d ▼



News of the Week

E.E.–G.E.C. MERGER DISCUSSIONS

Holding company a possibility

DISCUSSIONS are being held between the boards of the English Electric Co. and the General Electric Co. with a view to bringing about a merger of the two concerns under a holding company. An announcement on Tuesday evening to shareholders says that the two boards have been jointly considering the position of the British electrical industry and feeling that the manufacturing activities of their two groups are complementary, have decided that the practicability of a merger should be investigated.

The capital of GEC is £45,750,000 of which £18 million is Ordinary stock. English Electric capital is £50,300,000, of which Ordinary stock accounts for just over £30 million. Trading profits of these two companies for their last year are approximately equal, and it is the difference in degree of capital held by Ordinary shareholders that accounted for the higher price of GEC shares before the announcement. They were priced 42s on Monday night against the corresponding price for EE Ordinary of 35s 3d. The gross yield of English Electric is 5·6% and for GEC 4·7%. For some weeks there has been speculation in financial circles on a possible GEC link-up with another concern.

A.S.E.E. presidential address meeting postponed

OWING to the indisposition of the Earl of Verulam, ASEE president-elect, the presidential address meeting of the association, arranged for 18 Oct. in London, has been postponed. Sir Josiah Eccles retires from the presidency on 18 Oct., but to meet the wish of the ASEE council he has consented to become acting-president from that date and to continue in that capacity until such time as Lord Verulam is able to take up his duties.

Strike in N. Ireland

FOLLOWING a breakdown in negotiations over pay increases, some 400 members of the clerical and administrative staff of the Electricity Board for Northern Ireland went on strike on Friday last. Way back in April, the N. Ireland area council of the Clerical and Administrative Workers' Union, to which the staff belong, served ten days' strike notice on the Board in support of a claim lodged in November, 1958, for parity in salaries with the electricity supply industry in Britain. Discussions then took place under the auspices of the Ministry of Labour, and strike action was deferred, the Board, meanwhile, operating the principle of parity and equal pay to women.

Subsequent negotiations broke down on proposals to introduce lower gradings for certain district office staff, to introduce lower gradings for certain female staff and to absorb immediately service increments and plus payments accruing to individual members. The Board have stated that they are anxious to have further discussions on the matter.

E.M.I. Acquire Ardente

IN another take-over deal Electric and Musical Industries Ltd. have acquired the share capitals of Ardente Ltd. and its associated concern, Ardente Acoustic Laboratories, in exchange for £255,320 EMI 10s Ordinary shares. The Ardente companies, with works at Acton, are primarily concerned in the manufacture of hearing aids and miniature electronic components. The business was founded in 1919 by Mr and Mrs R. H. Dent, and has been built up by them and their two sons, Mr Gordon Dent (now chairman) and Mr F. D. Dent (managing director). The transaction is valued at £610,000.

CONGO STOPS IMPORTS

A WIDE range of electrical goods are included in a long list of items whose import into the Republic of the Congo is now prohibited. The goods include generators, motors, converters (rotary or static), transformers, rectifiers, inductors, electro-magnetic equipment, domestic appliances with self-contained electric motor, shavers, hairclippers, industrial and laboratory electric furnaces and ovens, welding machines, water heaters, immersion heaters, irons, space heaters, cookers, switches, plugs, lampholders, switchboards and control panels.

APPROVALS BOARD TITLE

Application to B.oT.

APPLICATION has now been made to the Board of Trade for a licence permitting the registration of an organisation under the title of British Electrical Approvals Board for Domestic Appliances, with limited liability but without the word "Limited" to its name. Objections to such a registration must be lodged with the Board of Trade by 10 Oct. That is the latest step in the formation of the testing organisation being established for the industry.

In the formal notice, the principal objects of the Association are given as:

To sustain and improve and assist in sustaining and improving the standards of safety and efficiency of domestic electrical appliances used in the UK, whether manufactured in the UK or imported from abroad, and to disseminate information in regard thereto, and in particular, but without prejudice to the generality of the foregoing:

To test or procure to be tested domestic electrical appliances and to grant approval to appliances found to be satisfactory. To grant certificates of approval in respect of appliances and to grant licences for the affixing thereto of marks indicative of such approval.

To encourage by publicity and otherwise the acquisition and use of approved appliances, and to discourage the acquisition and use of appliances not approved.

To charge fees and receive remuneration for the granting of approvals, certificates and licences, and for any services rendered by the company to any person, and to receive subscriptions and donations for the purpose of the company generally or for any particular purpose within the objects of the company.

The provisional board of management has 14 members, composed of Messrs W. J. Bird, S. L. Pleasance, E. G. Pluckett, K. J. R. Cocke and T. Counter (appointed by BEAMA); Messrs J. I. Bernard, V. C. N. Baille, R. R. B. Brown, D. B. Irving and E. H. Skinner (representing EDA); Mr H. A. R. Binney and Mr G. Weston (of BSI); Mr L. C. Penwill (ECA); and Mr P. B. Etheridge (EWF).

First director of the board is Brig C. A. Zweigbergh, as we exclusively reported on 31 March last. A general council may also be established, consisting of not more than 30 members, invited to serve by the board of management to advise the board on any matters referred to it by the board.

Simms acquire factory

A LARGE modern factory and office block bordering the River Lea in Wharf Rd, Ponders End, has been acquired by Simms Motor Units Ltd. Site of the new factory exceeds five acres and the floor space covers more than 200,000 sq ft. The three-floor office block includes kitchen accommodation. Production in the new factory is scheduled to start next month.

South Scotland approves £1,535,000 reinforcement

TO relieve increasing load on Motherwell 132 kV grid substation, the South of Scotland Electricity Board plan to establish a new 275/33 kV substation at Wishaw, which is to be connected to the Strathaven-Kaimes 275 kV overhead line. This will provide a further source of supply to the 33 kV network in the Wishaw and Linnmill area where new 33/11 kV substations will be built at Belhaven, Overtown and Craigneuk. Total estimated cost of this scheme, which includes three overhead lines, is £1,400,000. In addition, the Board have approved a £135,000 scheme for supply reinforcement in the Kilmardinny-Bishopriggs area which will provide a 33/11 kV substation at Westerton and involves modifications to existing lines and equipment with some cable laying.

371 ft towers for Clyde crossing

THE South of Scotland Electricity Board have awarded to AEI the contract for the supply and erection of crossing towers, anchor towers and conductors for the crossing of the River Clyde by the 275 kV supergrid, near Erskine Ferry, Glasgow. The crossing towers, of Blaw Knox design, will be 371 ft high with a 60 ft sq base. They are designed to carry twin 0·4 sq in. s.c.a. conductors and will allow a specified clearance of 240 ft above high-water mark. Distance between anchor towers is 0·65 miles in a direct line. The work, scheduled for completion in December, 1961, will be carried out by AEI Construction (Cables and Lines) Division.

OFFICIAL PUBLICATIONS

Corporate Bodies' Contracts Act, 1960. Circular No. 51/60. HMSO, 3d (see page 496).

Ergonomics of Automation. DSIR Report. HMSO, 3s 6d.

Road Research, 1959. DSIR Report. HMSO, 7s (see page 474).

International Bank for Reconstruction and Development. Annual report.

Electricity Council Second Report and Accounts. HMSO, 9s 6d (see page 467).

CEGB Annual Report, 1959/60. HMSO, 9s.

Minister of Power's Report, 1s.

Area Boards' Reports: London, 4s; South Eastern 4s 6d; Southern and South Western, 3s 6d; Eastern, 5s; East Midlands, Midlands and South Wales, 4s 6d; Mersey and North Wales, 5s; Yorkshire, 4s; North Eastern, 3s 6d; North Western 5s. All from HMSO.

Report of visit to USSR by Delegation from Canadian Electric Utilities.

ESTIMATED METER READINGS

— Extension to two quarters

SCHEMES to reduce the cost of meter reading have been under consideration by area electricity boards recently. Some have already introduced experimental schemes for estimated readings in one quarter of the year and in the past few months the Midlands Electricity Board have extended the practice to meter readings once every two quarters in certain districts of their Shropshire and Herefordshire sub-area. At last week's meeting of the Midlands Electricity Consultative Council, the chairman, Ald The Rev R. A. Giles, said that area boards wishing to reduce meter reading costs had approached the Minister of Power, who had indicated that he would like the views of consultative councils on the subject.

In the subsequent discussion some members expressed concern that, under estimated readers, consumers who installed additional equipment might receive larger bills than they anticipated when actual readings were taken. The Council decided to seek more information on the matter from the Board and have invited the chairman, deputy chairman and the chief accountant to attend the November meeting.

The Eastern Electricity Board have decided to experiment with twice yearly meter reading in parts of the Fens subarea, including the whole of Cambridge. This plan is being introduced next month and, if it proves successful, may be extended to other parts of the Board's area.

This development springs from the views expressed by the Committee under the chairmanship of Sir Cecil Weir, in a White Paper on co-operation between electricity and gas boards, presented to Parliament in March, 1959. In this it was stated that: "It is very much in the interests of consumers that boards should be flexible in their ideas, trying out experiments designed to reduce the cost of administration and to increase the efficiency of the service."

HIGH COMMISSIONERS AT EXHIBITION DINNER

THE Rt Hon Sir Eric Harrison, High Commissioner for Australia, will be the principal speaker at the dinner arranged by the organisers of the Electrical Engineers' Exhibition, to be held at Grosvenor Hse on 13 Oct. Marking the opening of the campaign to attract buyers to next year's exhibition at Earls Court, the dinner will afford an opportunity for exhibitors to meet diplomatic and commercial representatives of overseas countries, in addition to executives in the industry. Those who have already accepted invitations to be present include the High Commissioners for Ceylon, Ghana and Pakistan; the Ambassadors for Afghanistan, Burma, Chile, Czechoslovakia, Hayti, Honduras, Iceland, Indonesia, Iran, Japan, Libya, Nepal, Peru, Thailand, Venezuela and Vietnam, the heads of Legations of Hungary and Romania, and Trade Counsellors of 28 countries.

Shop Stewards' Unofficial Meeting

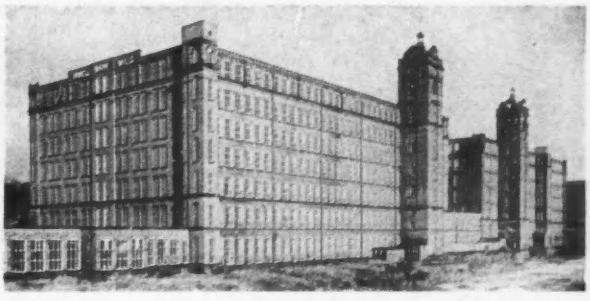
DESPITE the threat of disciplinary action by four of the five unions representing manual workers in electricity supply, the unofficial shop stewards' body held their meeting in Birmingham last Saturday. Mr George Wake, secretary, who was also concerned in earlier efforts for strike action, claimed that shop stewards from all five unions attended.

Last week four of the unions, including the AEU, urged their members not to participate in the unofficial meeting or have any connection with the movement. Mr Wake, apparently, is a member of the AEU. After last Saturday's meeting it was stated that the shop stewards who attended asked their unofficial national committee to deal with wages in the industry "at the appropriate time."

Officials of the union side of the NJIC met on Tuesday to consider matters.

Tariff Rise Warning

AT the Press conference held in connection with the Electricity Supply Industry's Reports (page 467), Electricity Council chairman, Sir Robertson King, said there was little doubt that every board would have to increase its prices in the light of increases in labour and coal costs.



This new factory of A. J. Flatley Ltd., the Irwell Bank Mills, Radcliffe, was formally opened recently. A substantial part is devoted to production of the 4½ cu ft refrigerator. Ransberg electrostatic spraying equipment is installed

D.A.D'S FIRST YEAR—*Report of operations*

AN active year of the BEAMA Domestic Appliances Division was reported to the a.g.m. last week when it was decided to continue the Division for a minimum of a further three years and to increase the number serving on the board from 12 to 15 members in order to reflect the increased membership of the Division, which now numbers 75, included within the seven sections. Among the matters reported by the chairman, Mr W. J. Bird, was the success of their liaison with distributive organisations, although they had yet to meet the electricity boards, and that the provisional board for approval for domestic appliances had almost completed their plans.

In the overseas field the activities of the Division had resulted in the associations of the EFTA countries receiving an invitation to join the CECED, the organisation representing appliance manufacturers in the ECM countries. The Division had been active in the export field and, in the first six months of this year, there had been a rise of 17½% in appliance exports. It was stressed that this was not to be interpreted as a result of the recent credit restrictions and it was reaffirmed that a healthy home market was a necessity for an exporting industry. BEAMA, it was suggested, would be willing to help the smaller firm in exporting, even though they were not members. Speaking of imports, Mr Bird said that unless firms can learn to live with the competitive conditions of the export market they will not survive at home.

The Division had continued their work throughout the year in the compilation of statistics and had given evidence before the Molony Committee on consumer protection. On the question of credit restrictions they have stressed to the Government the importance of stability, a factor more vital to manufacturers than the actual extent of any restriction

56% pass A.S.E.E. Diploma examination

RESULTS of the fourteenth examination for the ASEE Diploma shows that 56% of the entrants were successful. Majority of failures occurred in the written part of the examination and the association considers that this supports their view that the standards set are sufficiently high. Existing regulations and syllabus will apply to the 1961 Diploma examination, entries for which have to be submitted by 1 March.

MUNICIPAL CONTRACTS

NEW arrangements for the formalities required before a contract becomes binding on a local authority are set out in the Corporate Bodies' Contracts Act, 1960, which came into force at the end of July. A Ministry of Housing and Local Government circular says that the Act places local authorities substantially in the same position as a private person, both as regards written contracts and oral contracts. Except where a contract would be required to be sealed if made by a private person, absence of the local authority's seal will not prevent the authority from being bound in contract. Thus a council will be bound to a contract entered into by any person who, under ordinary law, is deemed to have authority to act on the council's behalf.

Ice-free Hanger Lane underpass

AN electric warming system is being installed at one end of the tunnel roadway of the Hanger La, Ealing, Underpass scheme—where the gradient is 1 in 25. Over 600 ft of Aerialite heating cable is being laid between the two layers of road surfaces, giving a total loading of about 300 kW. The installation, which will be thermostatically controlled, will also have a wetness detector to restrict operation of the system in dry but cold conditions. It will be in operation this coming winter. The work is being carried out by Malcolm and Allan (London) Ltd. as sub-contractors to A. E. Farr Ltd., principal contractors for the project, to the specification of Rendel, Palmer and Tritton, consultants.

ALL-ELECTRIC ESTATES BRING GAS PROTEST

ANNOYED that new estates in Bromsgrove are to remain "all-electric," even after more than two years of negotiations, the West Midlands Gas Consultative Council has decided to protest to the Ministry of Power and the Ministry of Housing about the refusal of Bromsgrove Urban Council to permit gas supplies to new housing estates. The gas people maintain that there should be freedom of choice, but an official of the Urban Council has said it was a decision, made several times recently, to have all-electric housing estates—deciding on one form of fuel was far cheaper when making the original installation than providing a choice of two. There was also economy in administration when only one form of fuel was available, and another point was that when tenants transferred from one house to another there was less chance of difficulty in changing over domestic appliances, he added.

Babcock in S. Africa

A LONG-TERM agreement for closer co-ordination of their manufacture has been finalised by Babcock and Wilcox Ltd., of London, and Vanderbijl Engineering Corporation Ltd., of Pretoria. Under the agreement, to operate from 30 Dec. next, the manufacturing facilities of Vanderbijl will be expanded by purchasing the present Vereeniging works of Babcock and Wilcox of Africa (Pty) Ltd., valued at about £1 million. In part payment of those assets Babcock and Wilcox Ltd. will acquire 400,000 ordinary shares in Vanderbijl, and at the same time the latter will take a 25% holding in the African company of Babcock and Wilcox.

It is emphasised that the sales, engineering, contracting, erecting of Babcock steam-raising plant and other products will remain the responsibility of Babcock and Wilcox and that its operating company will continue to operate from the present offices at Vereeniging. The transaction is subject to the approval of the UK and South African Treasuries.

Cooker wallchart

AN educational wallchart on "The Electric Cooker" has just been published by Educational Publications Ltd., in collaboration with the Modern Cooking Promotional Committee and the EAW. The chart, price 1s, shows the main components of an electric cooker, the different types of switches for controlling the boiling plate, the various boiling plates in common use and how they should be used for maximum efficiency. The use of automatic time controls and hints on cleaning are also illustrated.

N.C.B's £7m loss for half year

THE National Coal Board has estimated its deficit for the first half of 1960 at £6,902,000. There was, in fact, a surplus of £3,221,000 for the first quarter, but a deficit of £10,123,000 in the second quarter has changed the situation. Before payment of interest, a profit of £13,303,000 was made in the first half of 1960—£13,375,000 during the first quarter and a deficit of £72,000 in the second quarter. Interest payable to the Minister of Power was £20,205,000. Total cost per ton of saleable coal was 82s 1·6d and proceeds were 84s 3d, leaving a profit, before charging interest of 2s 1·4d.

The NCB emphasise that results for the first quarter are usually good and normally the best of the year. The second quarter's deterioration is partly due to the incidence of Easter and Whitsun holidays.

Glasgow suburban rail electrification

FIRST electric train services on the West of Scotland's suburban railway electrification scheme will operate from 7 Nov. The present 11 steam train services from Balloch to Queen St, Glasgow, will be replaced by 35 electric trains and running time cut by 15 min. At Airdrie, 75 electric trains a day will replace the present 25. The trains will run at fixed intervals, but there will be no timetable, Col D. H. Cameron of Lochiel, chairman of the Scottish area board of British Railways, announced last week. The new trains will have sliding doors and push-buttons similar to the London Underground service.

A large part of this electrification is within the boundary of the city of Glasgow. Plans are in hand for the electrification of the Cathcart circle route.

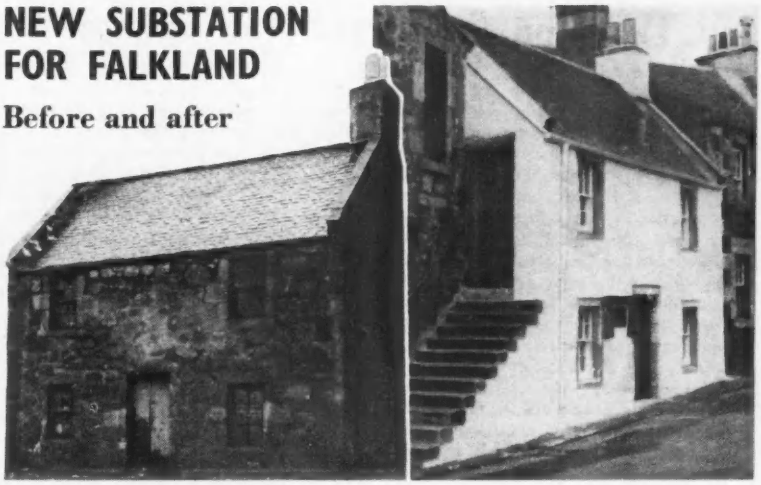
National Housing Exhibition

THE latest trends in electric heating, with special emphasis on under-floor warming systems for flats and houses, will be featured on the stands of the Electrical Development Association at the exhibiton at the Corn Exchange, Brighton, held in conjunction with the National Housing and Town Planning Conference, from 25 to 27 Oct. Enlarged photographs and tabulated data will give full particulars of the extent and running costs of floor-warming in a variety of blocks of flats and housing schemes in different parts of the country.

A number of display panels will indicate the value of electric cookers and water heaters in enabling housing authorities to comply with the Clean Air Act, and of special interest in this connection will be an electric fire lighter exhibited, which operates on the hair-dryer principle. Space will also be devoted to explaining the merits of the ring-circuit system of house wiring.

NEW SUBSTATION FOR FALKLAND

Before and after



THE idea of Mr G. T. Allcock, Fife area manager of the South of Scotland Electricity Board, the old house shown left above, in Falkland's main cobbled street, is now the Board's latest substation, capacity 100 kVA. The early 18th century cottage which was rapidly falling into ruin—it had been empty for 20 years—has been restored by the Board in collaboration with the Historic Trust for Scotland while maintaining the original architectural characteristics. The intermediate floor was removed to permit installation of the equipment and the result of the renovation work is shown in the illustration on the right. Some hundred years ago, the ground floor of the dwelling was used as a "Reading Room" by a local stonemason who held readings for all who cared to hear him. The title of "Reading Room" continues, but for a substation which was commissioned on 16 September.

NEW ROUTES TO A.M.I.E.E.

EASIER procedure for senior engineers wanting to transfer from the class of Associate IEE to that of AMIEE is being provided by the Institution of Electrical Engineers. Such men may now be given permission to submit an engineering report and attend an interview in the course of which they will be asked to discuss the report. At the interview, referees appointed by the IEE Council will look for evidence of "a broader outlook, a critical appreciation, a logical presentation of the subject and a sound engineering judgment." They will question the candidates critically to ensure they have a real appreciation of the underlying principles of the topic. Previously, Associates have had the choice only of passing the Institution examination or writing a thesis. The IEE Council, the current *Journal of the IEE* records, have been concerned that a number of engineers holding senior posts have been unable to transfer from Associates to AMIEE.

Another change made is designed to meet the difficulty experienced by some students in finding the approved preparatory courses for the special subjects to Part III of the Institution examination. In certain cases course work will be waived. There is also to be provision for presentation of an essay as an alternative to passing an examination in the special subject of Part III.

Ultra Anniversary Lecture

THE third Ultra anniversary lecture will be given in the Recital Room of the Royal Festival Hall at 6.30 p.m. on 12 Oct. The speaker is Mr G. W. A. Dummer, superintendent, Technical Services Dept., Royal Radar Establishment. His paper is entitled: "The Changing Role of Electronic Components." Tickets are obtainable on written application to the PRO of Ultra (Holdings) Ltd., at Western Ave., Acton, W.3.

What E.D.A. offered Herbert Morrison

WHEN Lord Morrison of Lambeth, as Herbert Morrison, lost his seat in the House of Commons in the 1931 general election, the Electrical Development Association offered him £5,000 a year to become their executive chairman. This he records in his autobiography published this week by Odhams Press. He records that he turned down the offer, whereupon the South Metropolitan Gas Co. made an offer of an executive post at a salary to be named by him. Earlier, of course, the then Mr Morrison had as Minister of Transport been responsible for electricity supply in the 1929 Parliament, but his reference to this period in a largely political rather than personal autobiography gives no direct attention to the problems of electricity.

Talks on the Nevis H.E. Scheme

THE proposed Glen Nevis hydro-electric scheme in Lochaber and the question of an electricity supply for the two Inverness-shire Hebridean islands of Barra and North Uist, are to be discussed by representatives of the North of Scotland Hydro-Electric Board and the Inverness County Council next week. For some time now, councillors representing the Lochaber area have been pressing for more information on the Board's plans for the Nevis scheme, particularly as to its effect on Glen Nevis. The opportunity to discuss the position of supplies for Barra and North Uist is also regarded as important, for there has been agitation on the matter for some time now. The question has also been discussed at a meeting of representatives of the Scottish Home Dept. and the Board. Recently, in replying to the County Council's representations, the Scottish Home Dept. stated that the capital cost of providing electricity to North Uist and Barra was estimated at £750,000 and the Board anticipated that they would be faced with an annual deficiency of £60,000 if the islands were to receive a supply of electricity. It was also pointed out that the Board were already incurring a loss of over £100,000 a year in providing supplies to consumers in the Outer Hebrides. In addition to those islands, the Board had to consider other areas without supplies, a problem which is causing much concern.

Rubber Exhibition and Symposium

THE many facets of the rubber industry, including raw rubbers, latices, chemical ingredients, processing equipment, manufactured rubber products, as well as research and education, will be on show at the 87 stands in the International Rubber Exhibition and Synthetic Rubber Symposium, which opens at Church Hse, Westminster, on 11 Oct. This will be the first Rubber Exhibition to be held in Britain since 1921.

Nearly 1,000 delegates are expected to attend the Symposium at which papers will be presented by experts from six countries.

Supplies in Orkney

A START is to be made next year on providing the remainder of the Orkney mainland with electricity, Mr Jo Grimond, M.P. for Orkney and Shetland, has been informed by Mr R. F. Walls, district manager of the North of Scotland Hydro-Electric Board. Mr Grimond has also been urging the Board to supply electricity to the outer North Isles.

Skefko expands northwards

A SUBSIDIARY company is to be formed by the Skefko Ball Bearing Co. to develop the firm's activities in technical and manufacturing research. Negotiations are under way for the construction of a factory near Irvine, Ayrshire, with facilities for manufacturing some of the specialised machine tools used in the manufacture of ball and roller bearings. It is not, however, the intention of the company to reduce the present toolroom facilities at Luton, but rather to develop these still further. In addition, it is intended to house at Irvine certain auxiliary departments concerned with manufacturing operations which can most conveniently be separated from the main production of bearings at Luton and Sundon.

Automatic Shop Blinds

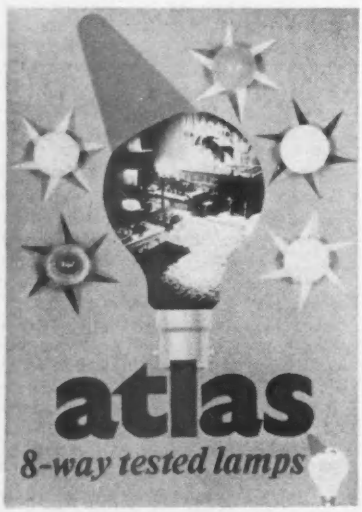
A NOVEL application of an automatic Radiovisor lighting control unit has proved completely successful at Robinson and Cleaver's shop window in Regent St, W.1. Automatic photoelectric equipment incorporating a time delay controls a number of geared motor units which extend and withdraw the shop blinds, protecting the merchandise displayed from direct sun rays. The latter part of the scheme was designed by Artistic Blind Co. The time delay is arranged so that "hunting" of the drive to the blinds is prevented during changeable weather when lighting intensity varies due to passing clouds. The automatic photoelectric unit also switches on and off, automatically, the shop window lighting.

Down Lambeth Way

WITH the aim of reducing maintenance costs of side-street lighting, Lambeth Borough Council are experimenting with the idea of seeking residents' co-operation. In its Angell Ward, notices have been sent to 170 residents who have a lamp-post outside their front door, asking them to give early notification if the lamp goes out. Normally, inspectors from the London Electricity Board patrol the street, but the cost to Lambeth is 18s 6d per lamp annually. As there are about 3,000 such lamps in the borough, the cost to the council is considerable.

Oxford 275 kV line

A CONSULTANT is to be retained by the Oxford and District Joint Advisory Planning Committee to advise it on the proposals of the CEGB for a 275 kV line and substation in the area. The consultant is to advise the Committee on all aspects of the matter, including whether the line is needed at all.



This striking illuminated showcard intended for window display, forms part of Atlas lamp campaign this autumn

Italian Bouquet for Design Council

WINNING the 1959 "International Golden Compasses Award" made annually by Italy's largest department store culminates a year of achievement for the Council of Industrial Design. The Award is for outstanding contributions to industrial design and is a particular distinction in view of the acknowledged Italian lead in this field. Other achievements by the Council, published in its 1959-60 report, include maintenance of an average of 2,200 daily visitors to the Design Centre in the Haymarket and the fact that certain shipping companies, hotels, public corporations and other large purchasers now make use of the Council's index in selecting articles. On the part of industry, there has been a significant increase in inquiries from manufacturing firms for the services of designers listed by the Council.

During the year 4,661 items were submitted to the "Design Index" selection committees, and of these 2,540 were eventually accepted. At the end of the period the Index contained 9,891 items made by 1,428 firms.

Castle Donington ash disposal

THE CEGB is faced with a problem over the disposal of ash from Castle Donington power station. So far, the ash has been piped to old gravel workings at Lockington, but as these are now filling up, the Board proposes to re-excavate a large area of the workings and take the ash away in lorries, leaving the pits free again for piping. The County Northern Area Committee, asked to approve the plan, have deferred a decision. The planning officer is to suggest that the Board use a smaller area for excavation and subsequent re-filling.

Using heat from industrial furnaces

WASTE heat recovery from industrial furnaces is to be the subject of a summer meeting and conference organised by the Institute of Fuel at Bournemouth next year from 15 to 19 May. The conference will consider the fundamental principles of heat recovery and types of equipment, and will have before it papers describing schemes operating in specific industries. Amongst authors will be Mr A. W. Alexander, of BICC, speaking on waste heat recovery in the non-ferrous metals industries; Messrs W. P. C. Ungoed (SCOW) and C. E. Sayer (McLellan and Partners) on the use of waste heat steam for generating electricity; and Mr N. M. Clark (Power Jets) on gas turbines as a means of recovering waste heat.

Transporting Radioactive Material

REGULATIONS for safe transport of radioactive materials have been approved by the International Atomic Energy Agency. The regulations, which have been drafted by two expert panels, are strongly recommended by the Agency for use as a model for relevant national legislation, and for acceptance as applicable to international transport of radioactive substances. The international railway transport organisation has indicated its willingness to accept the major part of the recommendations, and the international civil aviation organisation has co-operated fully in the drafting discussions. The regulations are intended to apply to the shipment of radioisotopes for scientific, industrial and medical uses, as well as to fissionable materials and large radiation sources.

Sayings OF THE WEEK

"Unless firms can learn to live with the competitive conditions of the export market they will not survive at home." . . . W. J. BIRD, chairman, BEAMA Domestic Appliance Division.

"The striking fact is that progressive improvements in street lighting, although not as rapid as many would like, have not been followed by a decrease in the number of accidents." . . . T. C. FOLEY, secretary, Pedestrians' Association for Road Safety, writing to the *Daily Telegraph*.

"The Euston main line electrification project as a whole will provide a vastly better service and a good return on the investment." . . . A. J. PEARSON, assistant general manager, London Midland Region, writing to *The Guardian*.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, September 27

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	232½	−4
" (3 months)	233½	−3
LEAD, refined pig, 99·97% purity (cash)	68⅜	−1⅛
" (3 months)	69	−1⅛
TIN, refined, min. 99·75% purity (settlement)	805	−½
" (3 months)	802	−1
ALUMINIUM, ingots 99·99·5% ...	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	207½	—
SILVER (Troy oz)	79¼d	—

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	87	+½
" (3 months)	85½	+⅜
RUBBER, per lb No. 1, RSS, spot	29d	−2⅛d
c.i.f. basis, ports, Nov. ...	30⅛d	−⅛d
ARMOURING: Galv. Steel Wire (0·104 in.) ...	66½	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	69	−½
AMERICAN PRICES: Copper, electrolytic (per lb) ...	33c	—
Lead, (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

30% INCREASE IN M.E.B's DEMAND

ON some days in recent weeks the demand met by the Midlands Electricity Board had been 30% higher than on comparable days last year, and it looked as if they would have a real struggle to meet the increased demand during the coming winter, Mr W. S. Lewis, chairman of the Board, stated on Saturday last. During the first five months of the current financial year the demand in the Board's area was 12½% up on a year ago—in the last financial year the MEB had become the first area board in the country to buy more than 10,000 million units for distribution. Mr Lewis was speaking at Nechells power station's open day.

A representative of the MEB told the ELECTRICAL TIMES that the increase in demand was primarily due to rising industrial activity and to the greater use of electric heating.

One day this month, when the temperature was 25° to 30° down compared with a year ago, the demand for electricity rose by 27%, an increase which was general throughout the day.

Poor weather conditions may also be partly responsible for the Board's 21·9% increase in unit sales during August, a rise which was even surpassed by the Yorkshire Electricity Board, which recorded a 22·6% increase (see page 491).

E.R.A. Launches New Organisation

TO mark the setting up of the new ERA organisation (described last week, page 447) a reception was held to meet the new chairman of the divisional committees (see also page 487). After an introduction by Sir Leslie Gamage, the chairman of the Council, Mr O. W. Humphreys, pointed out that the ERA had some 350 members and a budget of £500,000 a year. Even if money were available, the supply of research engineers is so restricted that they dare not waste effort through unnecessary duplication. It was against this background that the new structure was introduced. At the reception there was a display of some of the ERA fields of activity.

Electrical Installations Course

FOR those interested in planning, supervising or executing electrical installations, Bournemouth Municipal College has arranged a short course of eight evening lectures entitled: "Utilisation of Electrical Energy." Subjects chosen cover a wide range and lecturers will be practising engineers who will endeavour to treat their particular subject "non-technically." The course runs from 28 Sept. to 16 Nov. Further information is obtainable from the Head of the Department of Electrical Engineering, Bournemouth Municipal College of Technology and Commerce.

Census of Distribution

THE Board of Trade is arranging to take a census of distribution relating to trade done in 1961. Forms will be sent out in January, 1962, for completion by all those engaged in the retail trade and in certain closely related service trades. The census is intended to provide a new basis for the monthly statistics. In addition to retailers, the census will cover businesses engaged in hiring out or repairing consumer goods.

News in Brief

The 750,000th home in the West Country to receive an electricity supply—at Bath's Whiteway estate, Twerton—was connected up last week. The consumer was presented with an automatic electric cooker by Mr S. F. C. Whitmore, deputy chairman, South Western Electricity Board.

Annual ball of the ETCTA will be held at Park La Hotel, W.1, on 7 Oct. Tickets from F. J. E. Simons, 42 Lower Barn Rd, Purley, Surrey.

The National Coal Board (North Western Division) has placed an order with Heyes and Co Ltd. for an initial quantity of 500 flameproof lighting fittings for the new Parkside Colliery, Newton-le-Willows.

Company Activities

QUITE a mixed grill for markets to digest! First, New York gave Mr Krushchev a ticker-tape welcome—but not the kind usually accorded visiting dignitaries. Wall St brokers found this time that their ticker-tapes had decided to take a very dim view of the proceedings. Down tumbled share prices so that the key Dow Jones industrial share index went to bed 15·42 points the worse for wear at 586·76, the biggest toss for a day in five years. Krushchev, of course, was just Wall St's cover story for a more real cause. Each day's worsening economic news shows the US economy to be entering another of its post-war "saucer-type" recessions and there has been little industrial response to the Authorities' cheaper money moves.

London reacted immediately to the Dow Jones nosedive but after this initial precautionary marking down by jobbers, prices responded rapidly as bargain buyers came into the market. But it was not long before some of the old clouds of uncertainty reappeared. Britain, too, is seeing the beginnings of a car over-production problem. Falling exports, especially to the USA, occurring, unhappily, at the same time as the effects of the domestic credit squeeze, are making themselves felt.

Similarly, the latest figures showing the decline in deliveries and sales of domestic appliances demonstrate to a high degree the efficacy of the "squeeze." These factors, together with our continued poor overall export performance, are not designed to inspire markets.

Yet on the other hand it is known that the heavier sections of industry remain, for the most part, buoyantly optimistic. Their capital investment plans have recently been revised upward from a spending estimate of 16% more this year on last year to 20% with the expectation of a further 20% more on 1960 levels next year. Then ICI—Britain's biggest industrial combine—came in last week with group sales for the first half of 1960 at £288 million, 15% up on January-June, 1959, despite lower home prices, while profits after depreciation rocketed by as much as 50% to £50·04%.

Against a background of such varying evidence, electrical shares could be excused last week's pedestrian performance. Electric and Musical Industries moved down from 48s 9d to 47s on the Wall St episode—about 25% or more of the stock is held by Americans — but struggled back to 48s 3d by the close of the week on the unexciting 2½% increase in trading profit to £6·9 million. And now that the dividend has been pushed up from 13½% to 17½%, as forecast, cover has been whittled down from 3·5 times to 2·4 times. Morphy-Richards for whom the EMI takeover offer closes tomorrow (30 Sept.) and which is, anyway, an EMI subsidiary, gave a better performance with a nearly doubled net profit of £634,479 (*£322,837*).

English Electric found a ready response for its £7 million 6% debenture 1980-85 at £96½%. Applications were received for over £15 million of stock. Their £1 Ordinary shares, however, were unchanged over the week at 35s 6d. AEI, Thorn Electrical, Vactric, 3s 6d down at 12s 9d, and Hoover "A" were also all easier among electrical leaders and it was only a modicum of piquancy that was contributed to the market menu by the somewhat meatier prices of E. K. Cole, GEC, Plessey and especially Dimplex, 3s 6d warmer at 43s 3d.—*From our City Correspondent.*

Calcutta Electric Supply Corpn.

With gross revenue for the year ended 31 March last increasing to £8,976,372, from the previous year's figure of £8,229,457, a final dividend of 4% tax free raises the total distribution to 7½% (7%). Expenditure, including depreciation, takes £6,965,160 (*£6,422,119*), taxation £659,601 (*£513,931*), and special appropriations absorb a further £575,000 (*£525,000*).

Clydesdale Supply Co.

This Scottish retailing organisation reports group trading profits of £1,372,812 for the year ended 31 March last. Corresponding total for the previous year was £853,967. Dividend is again 25%. There was a record turnover in the period covered by this report, and Mr I. A. Levine, the chairman, points out that h.p. restrictions since introduced have resulted in a decline in turnover. But the company continues to develop with new branches being opened.

Dorman Smith Holdings

With considerably increased sales, group profit for the year to 31 March last, before tax, jumped to £184,718 (*£100,531*). Dividend is also raised from 17½% to 33½%. Taxation absorbs £89,536 (*£50,005*) leaving a net profit of £95,182 (*£50,526*). Since the end of that year, sales of the electrical engineering companies in the group have continued to rise and Mr T. Atherton, the chairman, sees no reason why the profits for the current year should not be greater than those of last year. He anticipates that the full benefit from the moving of the D and S factory to Preston will be gained in the current and succeeding years. Last year British Klockner Switchgear had an outstanding year at home and DS Plugs Ltd. had an extremely good year both as regards sales and profits. Dorman and Smith enjoyed good sales and negotiations are in progress for establishment of a factory in India, but the domestic electric appliance business, started at a time when the market was falling, was not as successful as had been hoped.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid
1956	131,550	47,864	42	6
1957	166,793	57,344	51	12½
1958	175,956	61,469	55	12½
1959	142,681	47,278	37	17½
1960	238,242	92,804	80	33⅓

Electric and Musical Industries Ltd.

After charging depreciation, directors' emoluments, interest, etc., but before tax, the group profit for the year to 30 June amounts to £1,749,000 (*£1,726,000*). A final dividend of 12½% raises the total to 17½% as forecast (against the equivalent of 13½% last time). The payment is on capital increased to £9,057,000 by the one-for-five rights and a one-for-two scrip issue. For EMI the consolidated trading profit is £5,221,000 (*£5,074,000*).

English Electric Co. Ltd.

The issue of £7 million 6% debenture stock, 1980-85 at 96½% was a complete success, being well over-subscribed. Applications for up to and including £1,000 are being allotted in full, and for higher amounts approximately 35% is being allowed.

Hartley Electromotives

The opportunity to acquire the capital of this company by James Austin and Sons (Holdings)—to which we referred on 25 Aug.—arose because the chairman of Austin's, Mr R. G. Cooke, was for some time chairman of Hartley, it is now revealed. Group profit of Hartley for the year to 30 April last was £22,330 (*£30,675*). All profit since last April will accrue to Austin. Net assets of Hartley at the end of April totalled £305,419. Austins paid the first instalment of £139,000 last month under the deal, in cash from the group's own resources.

Morphy-Richards Ltd.

A second interim of 17%, as forecast, makes the total 25% for the year to 30 June last, on capital doubled by the scrip issue for this company which is now a subsidiary of EMI. The same payment was made for the previous year but on the smaller capital. Group profit for the year expanded to £1,439,546 compared with £851,075 for the previous period. After charging depreciation at £200,748 (*£172,239*) and taxation at £599,647 (*£351,961*), the group net profit at £634,479 is almost double that of the previous year's total, £322,837. Changes in the board are reported on page 486.

Dividends Declared

Thomas Bolton and Sons. Interim 2½% (*same*).

Hoffmann Manufacturing Co. Interim 7½% (*3½% equivalent*).

A. H. Hunt (Capacitors). Interim 5% (*same*), but on larger capital.

Watford Electric and Manfg. Co. Interim 5% (*4% equivalent*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

29 Sept.—Armagh C.C. (b) Electrical installation in Annvale Old People's Home, Keady. Details from architect: George D. Taylor, 27a English St, Armagh. Deposit £3 3s.

29 Sept.—Batley B.C. Supply of tungsten and discharge lamps.—See 15 Sept. issue.

29 Sept.—Epping U.D.C. Street lighting included in fixed-price tender for making up of Nicholls Rd (part).—See 15 Sept. issue.

30 Sept.—Stockton-on-Tees B.C. Electrical installation in shopping centre at Hardwick. Applications to Borough Architect, 28 The Square, by above date.

3 Oct.—Droitwich B.C. Supply, delivery and erection of 24 steel lighting columns, 25 ft, and five tubular steel brackets with 250 W colour-corrected mercury discharge lamps.—Advertised 8 Sept. issue.

3 Oct.—Featherstone U.D.C. Contract 2. Supply (nominated manufacturer) and installation of 60 250 W and 117 125 W mercury fluorescent and 30 85 W sodium vapour lighting units together with 25 ft and 20 ft reinforced concrete columns/control gear/erection/equipment wiring. Supply only of 197 60 W sodium lighting and control gear.—See 22 Sept. issue.

3 Oct.—Manchester C.C. Electrical installation in photographic, fingerprint, etc., sections at St. Joseph's Police Bldgs, Longsight.—See 22 Sept. issue.

3 Oct.—N.I. Hospitals Authority. Supply of three floor polishers/scrubbers, four heavy duty vacuum cleaners and one heavy duty dish-washer.—See 22 Sept. issue.

3 Oct.—Radcliffe B.C. Supply and installation of: 39 140 W sodium lamps on 25 ft concrete columns/brackets; two 60 W sodium on 15 ft columns and removal of 43 existing columns along A58, Bury-Bolton Rd. Borough Engineer and Surveyor, Town Hall.

5 Oct.—Birmingham C.C. Electrical installation, on fixed-price basis, at Junior Boys' Remand Home, 232 Moseley Rd. Deposit £2 2s, made payable to Sir Herbert J. Manzoni, City Engineer and Surveyor, Civic Centre.

6 Oct.—Belfast C.C. Lift installations in proposed College of Art.—See 22 Sept. issue.

6 Oct.—Cardiff C.C. Erection of 1,260 Class "B" concrete columns and complete installation of 80 W mercury lanterns/gear, on fixed-price basis, contract 6.—See 22 Sept. issue.

7 Oct.—Dun Laoghaire. Supply and erection of two 3½-ton cranes.—See 15 Sept. issue.

7 Oct.—Ilkley U.D.C. Supply, erection and putting into service of 3,100 yd of 400 W colour-corrected mercury m.v. lighting on steel columns complete with control gear, fuses and brackets for A65 lighting.—See 15 Sept. issue.

7 Oct.—N.I. Housing Trust. Electrical installations in (a) 61 dwellings at Ballyclare No. 2; and (b) 64 dwellings and one shop at Whitehead No. 3. Trust Offices, 12 Hope St, Belfast.

7 Oct.—Southport B.C. Electrical installation at Floral Hall.—See 1 Sept. issue.

8 Oct.—Chilton P.C. Supply of 21 sodium vapour and ten tungsten lamps/brackets/gear for trunk road lighting.—See 15 Sept. issue.

8 Oct.—East Kesteven R.D.C. Provision of additional power and lighting points included in modernisation of (1) 72 houses at Ruskington and Anwick; (2) 79 houses at Ashby and Blankney Fen; (3) 66 houses Gt Hale and Heckington; (4) 72 houses at Aunsby, Burton and Pedwardine; (5) 75 houses at Billinghay and N. Kyme; and (6) 28 houses at Cranwell, Leasingham and Wilsford. Architect, Council Offices, North Gate, Sleaford.

8 Oct.—Haslingden B.C. Rewiring of power circuits in 44 houses, Free La, Helmshore, and Cedar Ave, Haslingden.—See 15 Sept. issue.

8 Oct.—Ilkley U.D.C. Rewiring of 28 houses at Menston.—See 22 Sept. issue.

8 Oct.—North Witchford R.D.C. Contract 2. Supply and erection of duplicate 100 g.p.m. sludge pumps. Contract 3. Supply and erection of duplicate 20 g.p.m. and duplicate 100 g.p.m. ejectors, all complete with motors, starters and accessories.—See 15 Sept. issue.

10 Oct.—Armagh C.C. Electrical installation in Keady County Secondary Intermediate School.—See 15 Sept. issue.

10 Oct.—Bristol C.C. Supply and erection of dual fuel sludge gas/diesel engine alternators, 750 b.h.p./525 kW at 3·3 kV 3-ph., together with associated waste heat recovery plant, switchboards, switchgear, transformers and cables.—Advertised 22 Sept. issue.

10 Oct.—Bury C.B. Electrical installation in public library. Borough Engineer, Town Hall.

10 Oct.—Camberwell B.C. Provision of Group "A" 200 W sodium lighting on steel columns in place of existing lighting: A221, six 140 units (112 new, 28 retained); A2208, 12 units (nine new, three retained). Replacement on existing columns: A2, 70 units; A202, 108 units; A215, 98 units.—See 22 Sept. issue.

10 Oct.—Merton and Morden U.D.C. Supply and erection of 80 Class "A" mercury vapour and sodium lanterns/gear/wiring units on 25 ft concrete columns along Wandle Rd, Green La and Middleton Rd. Engineer and Surveyor, Morden Hall, S.W.19.

10 Oct.—Thorney P.C. Erection of 19 Group "A" steel columns and 140 W sodium lanterns/equipment.—See 22 Sept. issue.

12 Oct.—Aycliffe D.C. Supply of (List 5) electrical goods for erection of 132 houses. General Manager: A. V. Williams, Churchill Hse, Newton Aycliffe, near Darlington.

12 Oct.—Peterborough T.C. Lighting and power installations in 98 dwellings on Bluebell estate. City Engineer, Town Hall. Deposit £2.

13 Oct.—Northwich R.D.C. Supply and erection of 206 Group "B" 15 ft concrete columns, 290 lanterns/control gear and resiting of existing columns.—See 22 Sept. issue.

13 Oct.—Tyrone C.C. Electrical installation in Old People's Home, Omagh. Details from consulting engineers: McCandless and Barton, 6 Murray St, Belfast. Deposit £3 3s.

13 Oct.—Warrington R.D.C. Provision and installation of Class "B" lighting standards in various parishes.—See 15 Sept. issue.

14 Oct.—Belfast C.C. Supply of vertical fluorescent street lighting lanterns and brackets.—See 22 Sept. issue.

14 Oct.—Ellon B.C. Supply and erection of 21 Trunk Rd A92 lighting units. Burgh Surveyor: J. E. Dinnes, Station Rd.

14 Oct.—Glasgow C.C. Supply of 450,000 yd p.v.c. aerial cable.—See 15 Sept. issue.

17 Oct.—Wallasey C.B. Electrical installation in Moreton Secondary Modern School extensions. Borough Architect, Town Hall.—Advertised in this issue.

18 Oct.—Beverley R.D.C. (e) Electrical installation additions to 39 houses at Newbald, Wawne, Lund, Cherry Burton, Woodmansey, Little Weighton, Skidley and Swanland. Architect and Surveyor: G. Palfreyman, 22 Lairgate. Deposit £1 1s.

18 Oct.—Fylde Water Board. Garstang Borehole scheme: (a) two ¼ m.g.d. 170 ft head; (b) two surface pumps, 1 and 1½ m.g.d. at 320 ft; (d) cables; (e) switchboard.—See 22 Sept. issue.

19 Oct.—Kirkburton U.D.C. Supply and installation of 88 200 W sodium discharge lamps on 35 ft steel columns for A629 Penistone Rd (second part) lighting. Surveyor, Town Hall.

19 Oct.—Sunderland T.C. Cable laying, 2,000 yd of 2-, 3- and 4-core p.i.l.c.s.t.a. cable for street lighting. Borough Engineer, 27 Fawcett St.

22 Oct.—Bexhill B.C. Supply, erection and putting into service of 52 140 W sodium lamps on 25 ft reinforced concrete columns. Borough Surveyor, Town Hall. Deposit £2 2s.

24 Oct.—Beverley R.D.C. Supply and erection of: Contract 2, two 180 g.p.m. sewage pumps and two 100 g.p.m. sludge pumps; Contract 3, four 40 g.p.m. and two 30 g.p.m. sewage ejectors for Leven and Tickton Sewerage Schemes. Details from consulting engineers, John H. Haiste and Partners, Belmont Hse, 20 Wood La, Headingley, Leeds 6. Deposit £3 3s, each contract, made payable to R.D.C.

24 Oct.—E.B. for N. Ireland. Supply and erection of lighting and heating for No. 3 set at Coolkeeragh Power Station. Details from consulting engineers: Kennedy and Donkin, 64 Royal Exchange, Manchester 2. Deposit £5 5s.

24 Oct.—Kingston upon Thames. Roof re-

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 106 queries answered this week

"Prento" switchgear—makers of? L.E.B.—Prentice Ltd., Progress Wks, Gelderd Rd, Leeds 12, Yorks.

Quadrant Meter Co. Ltd.—address for? C.A.—Houseboat Wks, Radlett, Herts.

"Duplex" seed propagators—makers of? G.H.—John Pinches (Medallists) Ltd., 1 St. Luke's Ave, S.W.4.

"Braun" shavers—agents for? W.M.—Ronson Products Ltd., 352 Strand, W.C.2.

"Ocean" heaters—address for? T.E.—Hobourn Home Appliances Ltd., Temple Farm Wks, Strood, Rochester, Kent.

"Thermophil" electronic thermometers—agents for? E.L.—Headland Engineering Developments Ltd., 164-168 Westminster Bridge Rd, S.E.1.

"Sursum" switches—suppliers of? T.B.—Laidlaw and Ettrup Ltd., 25 Rutland Sq, Edinburgh 1.

"Ring-Dicator" illuminated indicator bell-push system—makers of? I.S.C.—Barber Electrical Services Ltd., The Airport, Weston-super-Mare, Somerset.

"Infrasol" infra-red heaters—suppliers of? D.L.W.—Grimwood (Croydon) Ltd., 59-65 Cross Rd, East Croydon, Surrey.

newal, electrical, ancillary works, etc., at Corpn. Depot. Borough Surveyor, Guildhall. Deposit £2 2s.

25 Oct.—Ealing B.C. (a) Supply of 88 140 W sodium lanterns/lamps/gear; (b) supply and erection of 85 25 ft steel columns.—Advertised 15 Sept. issue.

26 Oct.—Cardiff C.C. Complete £38,000 electrical installation, by contractors on N.I.C.E.I.C. roll, in proposed Teachers' Training College, Cyncode. City Surveyor, City Hall. Deposit £5 5s.

26 Oct.—Whitchurch U.D.C. Phase 1. Supply, erection and wiring of 45 150 W sodium lamps on 25 ft concrete columns and 59 85 W sodium on 15 ft columns. Engineer and Surveyor, Pauls Moss, Dodington, Whitchurch. Deposit £2s 2s.—Advertised in this issue.

31 Oct.—Oldham C.B. Conversion of 14 mechanical public clocks to electric drive or electric wind. Street Lighting Superintendent, Gas St.—Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

5 Oct.—Burma. Two-pin 5 A switch/sockets; 10 A tumbler switches; 15 A four-way fuseboards. Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/24655/69).*

5 Oct.—Kuwait. 50 50 A t.p. 500 V time switches. Dept. of Electricity, Water and Gas, Kuwait. B.o.T. (ESB 24182/60).*

10 Oct.—Burma. 25 motors. Director-General, Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/25177/60).*

12 Oct.—Canada. Twelve single-pole 60 kV outdoor station type lightning arresters of "Thyrite" or autovalve type. Chairman, Committee on Utilities and Personnel, c/o City Clerk, City Hall, Winnipeg 2. B.o.T. (ESB/25117/60).*

12 Oct.—Pakistan. Transformers, five items, from five to 500 kVA in quantities from five to 100. Assistant Director of Stores (I), W.A.P.D.A. Gardi Trust Bldg, Old Anarkali, Lake Rd, Lahore. B.o.T. (ESB/24431/60).*

15 Oct.—Pakistan. 69 voltage and 48 current transformers. Director of Purchase (E.P. W.P.D.A.), D.I.T. Bldg, Dacca. B.o.T. (ESB/24050/60).*

19 Oct.—Kuwait. 12 250 kVA, 30 500 kVA 11/433 kV oil-immersed transformers. Dept. of Electricity, Water and Gas, Kuwait. B.o.T. (ESB/24180/60).*

2 Nov.—Australia. 33 kV oil-filled aluminium sheathed cables, 12 items. Chief Engineer, Southern Electricity Authority of Queensland, Boundary St, Brisbane. B.o.T. (ESB/24606/60).*

15 Oct.—India. Two 200-ton o/h travelling cranes for Sharavathi Power Hse. Secretary, Stores Purchase Committee, "Asiatic Bldgs," Kempegowda Rd, Bangalore 9. B.o.T. (ESB/24638/60).*

2 Dec.—Australia. Three 30 MVA on load tap changing transformers. Chief Engineer, Southern Electricity Authority of Queensland, Boundary St, Brisbane. B.o.T. (ESB/24175/60).*

15 Dec.—Iraq. Complete airfield lighting installation in construction of International Airport at Qasr El-Meleh. Documents, fee £100, from Directorate General of Roads and Bridges, Baghdad, up to above date. Documents on view at offices of Sir Alexander Gibb and Partners, Queen Anne's Lodge, S.W.1.

CONTRACTS PLACED

C.E.G.B. Contracts placed during the past two months amounting in the aggregate to approximately £13,118,000 include: Ffestiniog pumped storage scheme: steel tunnel linings and penstocks protective coatings, E. and F. Richardson Ltd. Blyth B power station: construction of two reinforced concrete chimneys, The Mitchell Construction Co. Ltd. Thorpe Marsh power station: 66 kV, 2,500 MVA switchgear and ancillary equipment, Associated Electrical Industries Ltd.; two reinforced concrete chimneys, Bierrum and Partners Ltd.; floor slab and other floors and foundations, The Mitchell Construction Co. Ltd. Aberthaw power station: fire extinguishing equipment, G. N. Haden and Sons Ltd. Drakelow C power station: overhead electric travelling cranes for turbine house, Herbert Morris Ltd. Rugeley power station: one 120,000 kW turbo-generator, No. 3, feedheating plant and dry cooling tower, The English Electric Co. Ltd. Willington A power station: ash disposal pit and extension to pipelines, John Cochrane and Sons Ltd. Drakelow C: structural steelwork, Peirson and Co. Ltd. Bankside B power station: h.p. pipework and valves, Stewarts and Lloyds Ltd.; booster and boiler feed pumps, The Harland Engineering Co. Richborough power station: three cooling towers, Film Cooling Towers (1925) Ltd.; superstructure, Turiff Construction Corporation Ltd. Fawley North substation: two 45 MVA, 132/11 kV transformers and earthing transformers, C. A. Parsons and Co. Ltd.; extensions to 132 kV switchgear connections and protection, Associated Electrical Industries Ltd. Swansea North substation: one 45 MVA, 132/33 kV transformer and earthing transformer, Fuller Electric Ltd.; 132 kV outdoor switchgear, Associated Electrical Industries Ltd. Kirkby substation: 132 kV outdoor switchgear, Associated Electrical Industries Ltd. Carrington "Local" substation: one 45 MVA, 132/33 kV transformer and auxiliaries, Associated Electrical Industries Ltd. Austin-Canons substation: two 90 MVA, 132/33 kV transformers, Fuller Electric Ltd. Aylesbury substation: two 90 MVA, 132/33 kV transformers, Hackbridge and Hewittic Electric Co. Ltd. Hemel Hempstead substation: two 90 MVA, 132/33 kV transformers, Fuller Electric Co. Ltd. Watford substation: one 60 MVA, 132/33 kV transformer, Crompton Parkinson Ltd. Barking substation: four 75 MVA, 275/33 kV transformers, Associated Electrical Industries Ltd. Exeter substation: one 180 MVA 275/132 kV transformer, Hackbridge and Hewittic Electric Co. Ltd. Taunton substation: one 180 MVA, 275/132 kV transformer, Hackbridge and Hewittic Electric Co. Ltd. Templeborough substation: four 75 MVA, 275/132 kV transformers, Associated Electrical Industries Ltd. Oswestry substation: 132 kV, 3,500 MVA switchgear, Associated Electrcial Industries Ltd. Kingston substation: 132 kV, 3,500 MVA switchgear, Associated Electrical Industries Ltd. High Marnham substation: 380/275 isolators and connections, Associated Electrical Industries Ltd. Monk Fryston-High Marnham: 380 kV experimental line work, British Insulated Callender's Cables Ltd. Whitson substation: 275 kV overhead lines, Balfour Beatty and Co. Ltd.

C.E.G.B. (Eastern, London and S.E. Region). Contracts placed over £5,000 value during July/Aug. include: 33 kV cabling, Wimbledon, B.I.C.C., £7,933; overhead line works, Northfleet—Maidstone, Warshams, £23,851; civil works, Norwich, R. G. Carter, £14,234; 6·6 kV switchgear, Croydon, English Electric Co., £7,860; civil works, Hartley, R. Corben and Sons, £5,977; 132 kV cabling, Three Bridges, Pirelli-General, £11,128; overhead line works, Three Bridges—Shermanbury, Balfour and Beatty, £19,045; two 90 MVA 132/33 kV transformers, Austin-Canons, Fuller Electric, £160,780; two 90 MVA 132/33 kV transformers, Aylesbury, Hackbridge Electric, £160,780; two 90 MVA 132/33 kV transformers, Hemel Hempstead, Fuller Electric, £159,820; 132 kV switchgear, Letchworth and Wymondley, English Electric Co., £44,044; civil works, Stanmore, Maior Constructors Ltd., £22,578; one 60 MVA 132/33 kV transformer, Watford, Crompton Parkinson, £63,690.

Gazette Announcements

COMPANIES ACTS

H. Hyde and Co. (Hull) Ltd. Mr A. Jarratt, Queens Hse, Paragon St, Hull, appointed liquidator at extraordinary general meeting on 9 Sept.

Sounderaft Ltd. General meeting to be held at 37-41 Mortimer St, W.1, on 24 Oct., at 2.30 p.m., for the purpose of having an account of the winding-up laid before the members.

Whitetrade Ltd. P. G. Auger, 40 High St, Chatham, Kent, appointed liquidator as from 30 Aug.

BANKRUPTCY ACTS

Receiving Orders

Derby. K. King, electrical contractor and retailer, carrying on business at 71 Mansfield Rd, Alfreton. Receiving order dated 16 Sept.

Southend. Cirex Appliances, electrical distributors, of 3 Westminster Bldgs, 733 London Rd, Westcliff-on-Sea. Receiving order dated 15 Sept.

First Meetings and Public Examinations

Wolverhampton. R. S. Williams, retailer of domestic electrical appliances, etc., carrying on business at 46 Whiteoaks Drive, Finchfield, and formerly at 98 Warstones Drive, Penn. First meeting: 10.45 a.m., 30 Sept., at Official Receiver's Office, Somerset Hse, 37 Temple St, Birmingham 2; and public examination: 11 a.m., 16 Nov., at Court Hse, Queen St, Wolverhampton.

Worcester. G. H. Davies, electrical engineer and contractor, carrying on business at 79 Droitwich Rd. First meeting: 12 noon, 4 Oct., at Official Receiver's Office, 3 Sansome Pl, Worcester; and public examination: 2 p.m., 8 Nov., at The Shire Hall, Worcester.

Appointment of Trustee

Leeds. S. Vary, electrical dealer, carrying on business at 1a Kelsall Ave, Leeds. Mr R. W. Hellyer, Brotherton Chmbrs, Westgate, Leeds 1, appointed trustee as from 6 Sept.

Application for Discharge

Tunbridge Wells. J. H. Pickwell, formerly carrying on business as J. H. Pickwell and Co. as retailer of electrical goods and handicraft materials, at 79 London Rd, East Grinstead, and as electrical engineer and contractor, at 108 London Rd, East Grinstead. Order made on 4 Aug., discharged subject to certain conditions.

TRADE NOTES

Representation. Mr E. R. Speed is relinquishing representation of Lupus Electrical Products Ltd. in the London and Home Counties area to Mr J. Haworth, but continues as representative of the M.C.B. Co. (Manchester) Ltd. A similar change has occurred in the south and south-west where Mr C. L. Owen has taken over representation of Lupus Electrical Products Ltd. from Mr H. J. Conduit of Western Agencies Ltd., who continues with the representation of the M.C.B. Co. (Manchester) Ltd.

Amplivox Ltd. have appointed A. R. Bolton and Co. Ltd., Sighthill, Edinburgh 11, as their sales representatives for Scotland.

Change of Name. The title of Precision Components (Barnet) Ltd. has been changed to Kabi (Electrical and Plastics) Ltd.

New Branch. The Griffin and George group have opened a new Scottish warehouse, sales and servicing centre at Braeview Pl, Nerston, East Kilbride.

Hull H.Q. Marconi International Marine Communication Co. have opened new headquarters at Marconi Hse, Kingston upon Hull.

BUSINESS PROSPECTS

Aberdeen. £152,000 Children's Hospital out-patients' department planned.

Aylesbury. Raymond White and Riddley, Temple Sq, architects for £310,000 Gatehouse estate factory for New Holland Machine Co.

Barnsley. C. G. Carlisle and Co., 629 Penistone Rd, Sheffield 6, plan cog-rolling and billet-grinding plant on 16-acre site.

Belfast. Corporation to consider Belfast University scheme for students' centre.

Birkenhead. £20,000 adaptation at The Priory, Upton Rd, planned by Liverpool Hospital Board.

Birmingham. R. Watson (Birmingham) Ltd., 84 Ryland Rd, contractors for £26,000 Barr St and Hockley St industrial premises for Moorgate (Birmingham) Ltd.—Wilson, Lovatt and Sons, Clarence St, Wolverhampton, contractors for £1,400,000 assembly block, etc., at Longbridge for Austin Motors.—Three-year expansion programme planned for West Hill Training College.

Blackburn. Park Bros., electrical engineers, Bankfield Wks, Ordnance Rd, plan one-storey factory at Gate St of 75,000 sq ft.

Blyth. Atcost Ltd., Duke St, Darlington, and R. Hush, Union St, contractors for L. Wood's mineral water factory at Northumberland St.

Bootle. Education Committee plans £207,042 erection of St. Augustine's R.C. Secondary School.

Bournemouth. Cummings and Morrish, 102 Evering Ave, Parkstone, Dorset, plan factory and offices near Wallisdown Rd.—Durley Properties Ltd. plan light industry buildings at 24 Haviland Rd.

Bradford-on-Avon (Wilts). Richard Costain, St. George's Rd, Bristol 1, contractors for £90,000 extensions for George Spencer Moulton and Co.

Bristol. Bernard and Son, 26 Orchard St, Bristol 1, quantity surveyors for £100,000 Bristol Institute for the Deaf.—£250,000 extensions to University of Bristol Dental Hospital, Lower Maudlin St, planned by United Bristol Hospital Governors.—John Laing and Son, Mill Hill, N.W.7, contractors for G. B. Briton and Sons' Kingswood factory.

Burnley. Gawthorpe Foundation plans residential cultural centre, Gawthorpe Hall.

Bury St. Edmunds. Barber-Green, Olding and Co. have acquired 19 acres industrial estate land. They intend transfer of European headquarters from Hatfield and plan 70,000 sq ft factory, offices, cafeteria, etc.

Camborne. Twentieth Century (Boxes), The Promenade, Penzance, plan Pool area factory.

Cheltenham. Ford and Weston Ltd. contractors for £75,000 stage two of casualty and out-patients' department at General Hospital for S.W. Regional Board.

Coatbridge. Education Authority plans £464.000 extensions at St. Patrick's High School.

Crompton. Oliver Machinery Co., 196 Deansgate, Manchester 3, plan extensions at Durden St premises.

Cuckfield R.D.C. Tender: 28 Crawley Down dwellings. Engineer and Surveyor.—Also 29 Haywards Heath flats. Engineer and Surveyor.

Durham. Newrick and Blackbell. 58 John St, Sunderland, architects for Territorial Army and A.F. Association headquarters, Old Elvet.

East Kilbride (Scotland). Tender: 24-bed maternity unit, Alexandra Hospital. Group Secretary, Hairmyres Hospital, East Kilbride. Various trades.

Eckington. J. R. Bramah and Co., 123 Devonshire St, Sheffield 3, plan works extensions, Halfway.

Edinburgh. J. H. Kininmouth, 16 Rutland Sq, Edinburgh 1, architect of the Merchant Company Education Board's planned Mary Erskine Girls' School, Pavelston estate.

Falkirk. Falkirk Development Co., 140 West George St, Glasgow, plans £187,000 stage one of East end High St development.

Glasgow. Commercial and General Investments plan office block with shops at 5-11 India St and 324 St. Vincent St, C.2.—South of Scotland Electricity Board, Inverlair Ave, Glasgow W.4, plans district offices and muster centre at Barrland St.—Robert Matthew and Johnson-Marshall, 31 Regent Terr, Edinburgh 7, recommended architect for planned College of Nautical Studies.—J. Laidlaw and Sons, Rutherglen, contractors for Coates Bros. and Co. factory.

Halstead U.D.C. Tenders to be invited for fluorescent lighting installation, Braintree Rd to Sudbury Rd.

Hastings. Thorburn, Muirhead and Ptnrs, St. Leonards-on-Sea, plan 22-storey block of flats, restaurant, etc., on site of Grand Hotel. Architect: Thomas Sibthorpe, 10 Manchester Sq, W.1.

Hemel Hempstead. Honeywell Controls, Ruislip Rd, East Greenford, Middx, plan components factory on industrial estate.

Hertfordshire. N.W. Regional Hospital Board, Eastbourne Terr, W.2, plan £200,000 Welwyn-Hatfield hospital residential block at Howlands.

Hodnet. £107,000 extensions, etc., planned at St. Joseph's College, Hawkestone Park, for Community of the Redemptionist Fathers. Architects: Morris and Whithouse, 5 Edmund St, Birmingham 5.

Jarrow. Mr J. H. Carr, Curlew Rd, Jarrow, plans conversion of Curlew Rd premises to fertiliser factory.

Lichfield. Charterbridge Corporation, 8a Eccleston St, S.W.1, and Hart, Son and Co., Augustine Hse, Austin Friars, E.C.2, have major development scheme for Lichfield centre comprising shopping centre, motel, etc., at £¼ million.

London, N. R. Seifert and Ptnrs, 22 Gt. Ormond St, W.C.1, architects, for Lawrence Rd, Tottenham, warehouses for M and B, Wingate Investments Ltd.—**N.W.** Clifford Tee and Gale, 5 Buckingham Palace Gdns, S.W.1, architects for Ebonite Works mould shop, Willesden, for Joseph Lucas.—R. Seifert and Ptnrs, 22 Gt. Ormond St, W.C.1, architects for shops and offices on site of Camden Hippodrome, Camden High St, N.W.1.—**S.E.** E. A. Stone, Toms and Ptnrs, 28 South Audley St, W.1, architects for industrial building, Black Prince Rd, Lambeth, for Kingscourt Estate Ltd.—Widnell and Trollope, Broadway Court, Westminster, S.W.1, quantity surveyors for Worshipful Company of Haberdashers, Staining La, E.C.2, warehouses and offices at Goodwood Rd, S.E.14.—Wood and Weir, 5 Wigmore St, W.1, quantity surveyors for warehouse, offices, etc., Southwark St, for trustees of The Borough Market.—**E.** Hearn and Dollar, 43 New Cavendish St, W.1, quantity surveyors for £150,000 warehouse and office premises at Banner St, E.1, for S. and L. Deyong.—**S.W.** D. E. Harrington. 61 Frognal, N.W.3, architect for £¼ million offices at Petty France.—L. G. Dight, 35 Portland Pl, W.1, quantity surveyor for 32 Lower Sloane St flats for Atlas Securities.—**W.** Prudential Assurance Co., Holborn Bars, E.C.1, plan Bruton Pl, W.1, office block. Staff architects.—**W.C.** H. V. Lobb and Ptnrs, 20 Gower St, W.C.1, architects for rebuilding of offices, etc., at 44-45 Chancery La.

Manchester. Calthena Ltd., Leestone Rd, plan new factory, Shentonfield Rd, Northenden.—The Scottish Brewers plan canteen, offices, etc., at Red Tower Brewery, Moss Side.—J. Gerrard and Sons, Swinton, contractors for £58,000 Kellogg Co. warehouse extensions.

Morecambe. Manchester Hospital Board, Cheetham Rd, plan casualty and out-patients' depot, Queen Victoria Hospital.

Newport. Health Committee plans occupation centre and maternity and welfare centre, Malpas, at £94,735.—1961-62 programme includes erection of homes, ambulance depot and child clinic at Little Cattle Market site.

North Riding. Executive Council tender: Additions to Richmond Girls' School. Architect: D. C. Hall, 6 Masons Yard, Duke St, St. James's, London S.W.1.

Oldham. Glover and Main group, 48 Grosvenor Gdns, S.W.1, plan new administrative and research building, Hobson St.

Plymouth. Ranco, an American company, plans £150,000 factory for 1,000 staff at Southway.

Portsmouth. Midland Cattle Products, Wicor Bone Mills, Portchester, plan Western Rd factory.—H.B.S. (Trust) Ltd. plans Fitzherbert Rd factory and offices.—Dellagana and Denby Ltd. plan factory extensions, Dundas La.—De Havilland Aircraft, The Airport, plan conversion of canteen to tool room.—Sinah Investments plan four flatted factories, Victory Brewery site, Thomas St, Landport.

Reading. City and Central Developments, Park St, W.1, plan shops, offices, bus station, etc., at Vincents Yard.

Rotherham. Corporation Health Committee recommends planning for mental hostel at Park Lea, Doncaster Rd.

Salford T.C. Tender: Multi-storey block admin. offices, Crescent, for Health Dept. Engineer.

Scarborough B.C. £6,000 rewiring of 170 houses planned on Northstead estate.

Southend-on-Sea. C. T. R. Kelly and Ptnrs, 8 Manchester Sq, W.1, quantity surveyors for Commercial Shop Properties shops and offices.

Southport. Minister of Education includes Our Lady of Lourdes R.C. School in 1962-63 building programme.

Stone. Quickfit and Quartz, Quickfit Wks, Stone, Staffs, plans Walton factory.

Tamworth. Wilson, Lovatt and Sons, Clarence St, Wolverhampton, contractors for £137,000 Turner's Asbestos Cement Co.'s storage and dispatch building.

Twickenham. 12-storey office block planned on site of Regal Cinema by Centrovincial Estates.

Uttoxeter U.D.C. Tender: 34 houses, Heath Hse estate, Scheme 1. Surveyor.

Wallsend-on-Tyne. Associated Lead Manufacturers, Crescent Hse, Newcastle-on-Tyne, plan redevelopment scheme at works in Stephenson St. Company's architect.

Warrington. £30,000 development at Sankey Hospital planned by Liverpool Hospital Board.—Board also plans construction of six new wards at Warrington General, new ear, nose, etc., block and operating theatres.

Watford. L. G. Dight, 35 Portland Pl, W.1, quantity surveyors for City House Properties Ltd. shops and offices.

Wellington. Wilson, Lovatt and Sons, Clarence St, Wolverhampton, contractors for £160.000 Joseph Sankey and Sons' factory extensions, Hadley, Castle Wks.

West Hartlepool. David Brown, 10 Lamb ton Rd, Jesmond, Newcastle, architect for stage one extensions to St. Teresa's R.C. Primary School, Callender Rd.

West Lothian. D. Peddie, McKay and Jamieson, 8 Albyn Pl, Edinburgh 2, architects for Telegraph Condenser Co.'s Bathgate extensions, Whiteside Wks.

Weymouth B.C. Tender: 26 Melcombe Regis bungalows. Engineer, 6 Pulteney Bldgs.

Whitstable. Sir Robert McAlpine and Sons, 80 Park La, W.1, contractors for the American Machine and Foundry Co.'s factory.

Wilton. E. V. Naish, Felt Mills, Crows La. Wilton, Salisbury, plan single-storey building.

Wooburn, Staffs. P.C. plans £8,400 installation of major lighting scheme.

Wolverhampton. T.G. Construction Co., Ettingshall, contractors for £120,000 office block next main Stafford Rd for Goodyear Tyre and Rubber Co.

Worcester T.C. Tender: 108 Warndon estate dwellings. City Engineer.

MEETINGS TO NOTE

FRIDAY, 30 SEPT.

A.S.E.E. (Nottingham). Branch annual dinner. Trent Bridge Hotel.

A.S.E.E. (Reading). Branch dinner. Calcot Lounge Hotel.

SOCIETY OF INSTRUMENT TECHNOLOGY (Scottish Section). "Control Equipment for Ship Stabilisers," J. Bell. Building Centre, Sauchiehall St, Glasgow. 7.15 p.m.

MONDAY, 3 OCT.

I.E.E. (Mersey and N. Wales). Chairman's address, D. A. Picken. Royal Institution, Colquitt St, Liverpool. 6.30 p.m.

I.E.E. (S. Midlands). Chairman's address, Brig F. Jones. A.G.M. and conversazione. Grand Hotel, Birmingham. 6 p.m.

N.E. Electrical Club. A.G.M. and Presidential address. County Hotel, Neville St, Newcastle. 6.30 p.m.

A.S.E.E. (Bolton). "Heavy Industrial Control Gear," C. Curran. Railway Hotel, Trinity St. 7.45 p.m.

A.S.E.E. (Essex). "Maintenance of a Modern Oil Refinery," R. M. Williams. Angel Hotel, Broadway, Ilford. 8.15 p.m.

A.S.E.E. (Sheffield). "Control Systems—Simple Theory of Automatic Control," L. G. Barnfield. Royal Victoria Hotel. 7.30 p.m.

A.S.E.E. (Leeds). "Floor Heating," R. Bradbury. Gt. Northern Hotel, Leeds. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Cheltenham). "Hydraulic Servo Systems," Prof E. B. Pearson, Belle Vue Hotel. 7.30 p.m.

RAILWAY ELECTRIFICATION CONFERENCE at Institution of Civil Engineers until 7 Oct., and Exhibition at Battersea Wharf until 9 Oct.

TUESDAY, 4 OCT.

I.E.E. (N. Midlands). Chairman's address, F. W. Fletcher. Leeds and County Conservative Club, South Parade, Leeds 1. 6.30 p.m.

I.E.E. (N. Western). Chairman's address, F. Linley. Engineers' Club, Manchester. 6.30 p.m.

I.E.E. (S.E. Scotland). Centre Chairman's address, R. B. Anderson. Carlton Hotel, North Bridge, Edinburgh. 7 p.m.

I.E.E. (Rugby Graduates and Students). Chairman's address, "Heat Flow in Rotating Electrical Machines," T. J. Roberts. Rugby College of Engineering Technology. 6.30 p.m.

A.S.E.E. (W. London). "Electric Rotating Machinery." Windsor Castle Hotel, 134 King St, W.6. 7.45 p.m.

A.S.E.E. (Reading and Districts). "Current Trends in Cable Jointing." Marquis of Lorne, Friar St. 7.30 p.m.

WEDNESDAY, 5 OCT.

I.E.E. (Tees-side). Chairman's address, "Turbo-electric Propulsion for Ships," T. W. J. Temple. Cleveland Scientific and Technical Institution, Middlesbrough. 6.30 p.m.

I.E.E. (N.W. Electronics and Communications Group). Chairman's address, "Application of Electronics to Air-to-Air Missiles and Propeller Phase Synchronising Systems," C. Heys. Engineers' Club, Manchester. 6.15 p.m.

I.E.E. (S.W. Scotland). Centre Chairman's address, R. B. Anderson. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow. 6 p.m.

I.E.E. (Southern). A.G.M. and Chairman's address, R. Goford, C.E.G.B., 111 High St, Portsmouth. 6.30 p.m.

INSTITUTION PRODUCTION ENGINEERS (Scotland). "The Numerical Analogue Control of Machine Tools," O. S. Puckle. Royal Hotel, Union St, Dundee. 7.30 p.m.

ELECTRICAL ASSOCIATION FOR WOMEN. Quiz. 25 Foubert's Pl, W.1. 6 p.m.

N.W. FUEL LUNCHEON CLUB. A.G.M. and questions on "Nuclear Fuel—The Fuel of the Future," Sir Leonard Owen. Engineers' Club, Manchester. 1.30 p.m.

A.S.E.E. (Halifax). "Lifts," A. Buckley. Crown Hotel, Horton St. 7.45 p.m.

A.S.E.E. (N. London). "Static Electricity," S. J. Emerson. Wood Green Civic Centre, Town Hall, N.22. 8 p.m.

A.S.E.E. (S.E. London). "Ball Bearings," C. S. Clarke. Eltham Green School, S.E.9. 7.45 p.m.

A.S.E.E. (Manchester). "Crime Detection," Det Sgt Martin. Engineers' Club, Albert Sq. 7.15 p.m.

A.S.E.E. (Preston). "Crime Detection," Det Chief Inspector Gregory. R.A.F.A. Club, East View. 7.30 p.m.

I.E.S. (Newcastle). A.G.M., Chairman's address. County Hotel. 12.30 p.m.

I.E.S. (Edinburgh). "Lighting of Public Spaces in Passenger Ships—Past and Present," I. E. A. Phillips. Y.M.C.A. Social Rooms, 14 South St. Andrew St. 6.15 p.m.

I.E.S. (Swansea). Chairman's address. Demonstration Theatre, S.W.E.B., Kingsway, Swansea. 6 p.m.

JUNIOR INSTITUTION ENGINEERS (Midlands). Chairman's address, E. Masters, and A.G.M. James Watt Memorial Institute, Gt. Charles St, Birmingham. 7 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Scottish). "Technical Education for the Radio and Television Industry," J. B. Rimmer. Dept. of Natural Philosophy, The University, Drummond St, Edinburgh. 7 p.m.

THURSDAY, 6 OCT.

I.E.E. Presidential address, Sir Hamish D. Maclaren. Savoy Pl, W.C.2. 5.30 p.m.

CHELMSFORD ENGINEERING SOCIETY. Presidential address. Social Hall, Hoffman's. 7.30 p.m.

A.S.E.E. (Brighton, Hove and District). "Weather Forecasting," R. G. Veryard. New Imperial Hotel, 1st Ave, Hove. 7.30 p.m.

I.E.S. (Nottingham). Chairman's address. Electricity Centre, Carrington St. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (S. Western). Convention on "Aviation Electronics and its Industrial Applications" until 7 Oct. College of Science and Technology, Ashley Down Rd, Bristol.

BRITISH INSTITUTION OF RADIO ENGINEERS (Scottish). "Technical Education for the Radio and Television Industry," J. B. Rimmer. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow. 7 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (N. Western). "V.H.F. FM/AM Transistor Receivers," L. E. Jansson. Reynolds Hall, Manchester College of Science and Technology, Sackville St, Manchester. 7 p.m.

I.E.E. (Cambridge Electronics and Measurement Group). Chairman's address, "Design Processes for Electronic Equipment," H. V. Beck. Cavendish Laboratory. 8 p.m.

I.E.E. (N. Scotland). Centre chairman's address, R. B. Daniel. Dundee.

I.E.S. (Glasgow). "Exterior Lighting for Buildings," L. C. Rettig and H. Baker. British Lighting Council, 29 St Vincent Pl. 6.30 p.m.

FRIDAY, 7 OCT.

I.E.E. (Medical Electronics Group). Discussion, "Nerve Endings." Savoy Pl, W.C.2. 6 p.m.

I.E.E. (N. Staffs). Chairman's address, G. H. Gillam. N. Staffs Technical College, Stoke-on-Trent. 7 p.m.

A.S.E.E. (Liverpool and District). "A.C. Distribution Equipment for Ships," M. J. Bolton. Industrial Development Centre, M.A.N.W.E.B., Paradise St. 7.30 p.m.

A.S.E.E. (Sheffield). Dinner/dance. Kenwood Hall.

A.S.E.E. (Stoke and Crewe). Annual dinner. Grand Hotel, Hanley.

SOCIETY OF INSTRUMENT TECHNOLOGY (Fawley). "The Basic Principles of Digital Instrumentation," D. S. Evans. Admin. Bldg., Esso Refinery. 5.30 p.m.

I.E.S. (Leeds). Chairman's address. British Lighting Council, 24 Aire St. 6.15 p.m.

I.E.E. (N. Scotland). Centre chairman's address, R. B. Daniel. Aberdeen.

MONDAY, 10 OCT.

I.E.E. (E. Anglia). Chairman's address, "Electricity in the Service of Mankind," E. A. Fowler. Cavendish Laboratory, Cambridge. 6.30 p.m.

I.E.E. (N. Eastern). Chairman's address, D. H. Thomas. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (S. Midland Supply and Utilisation Group). "A Basis for Short-Circuit Ratings for Paper-insulated Cables up to 11 kV," L. Gosland and R. G. Parr. College of Technology, Gosta Green, Birmingham. 6 p.m.

I.E.E. (Western). Chairman's address, A. C. Thirtle. Bristol University. 6 p.m.

I.E.E. (N.W. Graduates and Students). Chairman's address, "Patents and Development in Electrical Engineering," D. F. Binns. Engineers' Club, Manchester. 7 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

A. Banks (York) Ltd., 28 St. Swithins Walk, York. To take over business of a wholesale electrical dealer carried on at York by Alwyn Banks, etc. Nom. cap.: £5,000. Dirs.: Alwyn Banks, John F. Brown and Peter Crooks.

Benelect Fires Ltd., 40 Couchman Rd, Alum Rock, Birmingham 8. Electricians, electrical manufacturers, etc. Nom. cap.: £100. Permanent dir.: Wilfred Bennett.

Eniac Ltd., 324 Gray's Inn Rd, W.C.1. Civil, mechanical, electrical, chemical engineers, etc. Nom. cap.: £100. Dirs.: Michael J. Geber, John A. H. Lever and Ivan M. Stoller.

Everest Domestic Appliances Ltd., 67 Lord St, Liverpool 2. Nom. cap.: £100. Dirs.: Constantine A. Angelis and Wilson M. Henry.

Fluoromatic Ltd., 294 Burton Rd, Derby. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £100. Dir.: Cyril S. Wheeler.

Green and Magee Ltd., Bois La, Chesham Bois, Amersham. Retailers of electrical household goods and as ironmongers, etc. Nom. cap.: £100. Dirs.: Charles C. Green, Peter J. Magee, Kathleen L. Green and Barbara J. Magee.

Heard and Spittle Ltd., 28 The Broadway, New Haw, Surrey. To take over the business of radio, television and electrical contractors carried on by R. Heard and A. H. Spittle at New Haw, etc. Nom. cap.: £1,000. Dirs.: Ronald Heard and Anthony H. Spittle.

Hessings (Finance) Ltd., 11 Tachbrook Rd, Leamington Spa. Manufacturers, repairers, servicers and hirers out of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £5,000. Dirs.: Georgina Bednell and Pamela M. Corp.

Hickmans (Swindon) Ltd., 66 Devizes Rd, Swindon. Dealers in electrical goods, etc. Nom. cap.: £5,000. Dirs.: Peter J. F. Enderby and Norman C. Gale.

Home Distributors Ltd., 7 Hastings Pl, Lytham, Lancs. Dealers in electrical appliances, etc. Nom. cap.: £100. Dirs.: John D. Buckley and John C. Gibson.

Lynbren Electrical and Trading Co. Ltd., 782 Seven Sisters Rd, N.15. Nom. cap.: £100. Dirs.: Brenton B. Mitchell and Mrs Sephylyn J. Mitchell.

Poldew Ltd., 2 Laings Corner, Mitcham. Designers, manufacturers of and dealers in radio and electrical apparatus, etc. Nom. cap.: £2,000. Dirs.: Alan Sproxton, Colin Sproxton and Ernest Layton.

Cled Smith and Sons Ltd. To take over the business of dealers in refrigeration equipment and electrical and refrigeration engineers carried on at 233 Penarth Rd, Cardiff, etc. Nom. cap.: £2,000. Dirs.: Cledwyn Smith and Ira Smith. Subs.: Geoffrey B. M. Williams, 36 Crystal Wood Rd, Heath, Cardiff; and Anthony W. P. Gribble, 63a Westbourne Rd, Penarth.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Carol. 798,453. Class 9. Recording apparatus, etc. Contronics Ltd., Garth Wks, Deepcut Bridge Rd, Blackdown, near Aldershot.

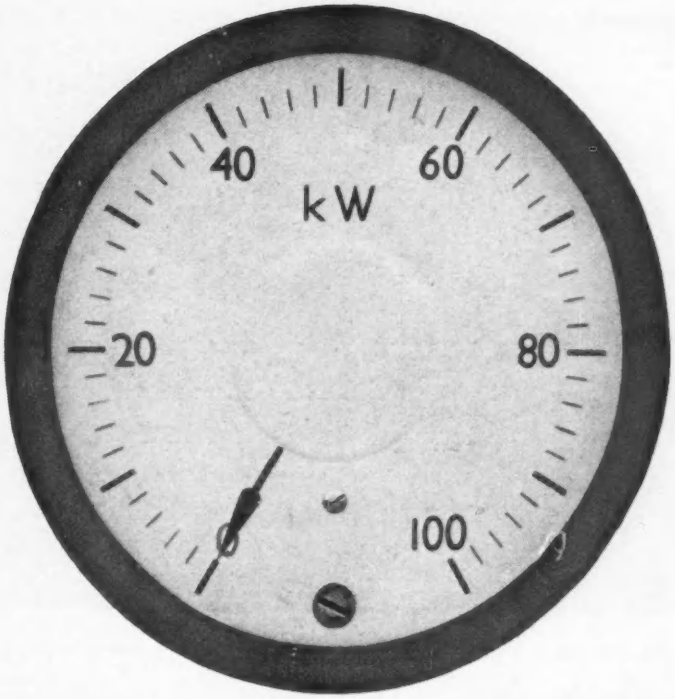
Lamp-o-Matic. 800,924. Class 9. Units incorporating ballast resistors for use with high wattage projector lamps to reduce voltage surge. Educational Foundation for Visual Aids Ltd., 33 Queen Anne St, W.1.

Onera. 772,472. Class 9. Apparatus, etc. Office National d'Etudes et de Recherches Aeronautiques. 29-39 Ave de la Division-Leclerc, Chatillon-sous-Bagneux, France.

Orbitron. 780,522. Class 9. Electron discharge tubes, etc. Orbitron Development Ltd., 74 Sparks St, Ottawa, Canada.

Phastrol. 799,874. Class 9. A.C. voltage regulators, etc. Westinghouse Brake and Signal Co. Ltd., 82 York Way, N.1.

Singer sewing machines in design. 791,162. Class 9. Oscillators for clothes making bonding machines, capacitors, resistances, etc. Singer Mnfg. Co., 107 Trumbull St, Elizabeth, New Jersey, America.



Long-range readability
WITH
AEI instruments

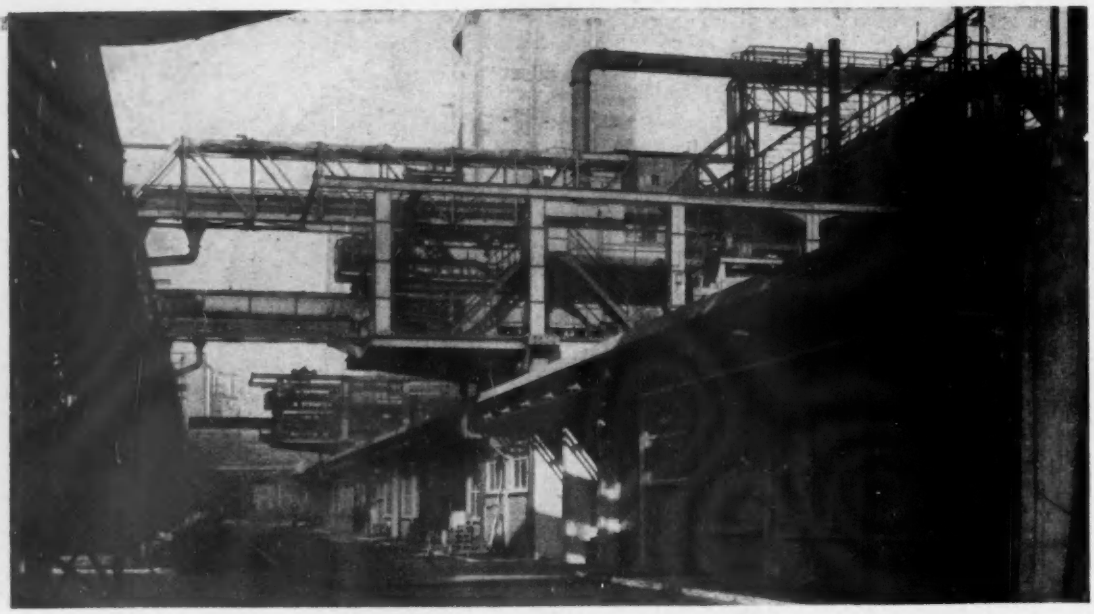
With its modern scale presentation, the AEI FC2 Wattmeter can be accurately read from a distance of many feet. It is typical of a wide range of instruments from AEI, including voltmeters, ammeters, power factor indicators and synchroscopes, developed for ease and reliability of use in modern power stations.

DIAL SIZES: *4 in., 6 in., and 8 in.*
PATTERNS: *Round projecting. Round flush (as illustrated). Round flush with square bezel.*

AEI

Enquiries to the address below or to your local AEI Office.

Associated Electrical Industries Ltd.
Instrumentation Division — Instrument and Meter Department
TRAFFORD PARK, MANCHESTER, 17



The ram side of the 66 coke oven battery at Manvers Main

Courtesy of National Coal Board & Simon Carves Ltd

MICROsen again——

——— crops up everywhere and not only on cranes and hoists. In this case it is incorporated in E.M.B. Control Gear Equipment for locating the ram beam exactly opposite to each oven to eject the red hot charge of coke. The MICROsen, which gives variable speeds ranging from 10% to full synchronous speeds, can be applied to any standard slip ring motor from 2 to 140 H.P.

THE SIGN OF QUALITY EMB ESTABLISHED 1908

EMB technical representatives

London	Midlands	Lancs & Yorks	Scotland
R. S. Montgomerie P. N. Jay	C. Cleveley	S. J. Pitt	L. Hopwood
Northwood 2159	West Bromwich 1171	Sheffield 55278	Glasgow Giffnock 0188

E.M.B. Co Ltd

WEST BROMWICH
Phone:- 1171
ENGLAND

CONTRACTORS TO THE ADMIRALTY, CROWN AGENTS TO THE COLONIES, SUPPLY DEPARTMENTS, DOMINION AND OVERSEAS GOVERNMENTS

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

COUNTY BOROUGH OF WALLASEY
Moreton Secondary Modern School Extensions
ELECTRICAL INSTALLATION

TENDERS, to reach the undersigned by 17 Oct., 1960, are invited for the above. Specification and Form of Tender obtainable from the Borough Architect, Town Hall, Wallasey.

A. G. HARRISON,
Town Clerk.
(S 173)

COUNTY BOROUGH OF OLDHAM
Public Clocks

TENDERS are invited for the conversion from mechanical drive to electrical drive or automatic electric wind of the 14 public clocks maintained by Oldham Corporation Lighting Department.

Form of tender, Specification and Conditions of Contract can be obtained from the Street Lighting Superintendent.

Tenders to be sent in a plain sealed envelope endorsed "Tender—Public Clocks" addressed to Chairman, Surveyors and Buildings Committee, c/o Street Lighting Department, Gas St, Oldham, by first post on 31 Oct., 1960.

EDWARD HAINES,
Town Clerk.
20 Sept., 1960. (S 172)

WHITCHURCH URBAN DISTRICT COUNCIL
STREET LIGHTING SCHEME—PHASE 1

TENDERS are invited for dismantling existing lighting points, supplying, delivering, erecting, wiring and fitting of:

45—25 ft concrete columns with 140 watt sodium discharge lamps;
59—15 ft concrete columns with 85 watt sodium discharge lamps

in the Urban District of Whitchurch in accordance with the Plan, Schedule and Specification prepared by the Council's Engineer and Surveyor, from whom Tender Documents are obtainable upon receipt of a cheque for two guineas being a deposit which will be returned upon receipt of a bona-fide Tender and the return of all Documents.

Tenders, in plain sealed envelopes endorsed "Street Lighting," to be delivered to the Clerk of the Council not later than 12 noon on Wednesday, 26 Oct., 1960.

The Council do not bind themselves to accept the lowest or any Tender.

FRANK CLAYTON,
Clerk of the Council.
Pauls Moss,
Dodington,
Whitchurch.
Shropshire.
(S 208)

APPOINTMENTS VACANT

ELECTRICITY SUPPLY BOARD (DUBLIN)
Vacancies for Instrument Mechanics in Steam Generating Stations

APPLICANTS should be qualified Instrument Mechanics and have good knowledge and experience of the various instruments used in generating stations.

Applications, stating age, education, technical qualifications and full details of experience, should be forwarded to the Personnel Officer, 27 Lower Fitzwilliam St, Dublin.

J. G. GARGAN,
Secretary.
(S 169)

AIR MINISTRY

REQUIRE ASSISTANT MECHANICAL and ELECTRICAL ENGINEERS for design, construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas as well as certain Civil Airports. Salary: £805 at 25 to £1,095 at 34 or over, thereafter rising to max. £1,260 with increase for London and slight decrease for country districts. Appointments non-pensionable but long term. Promotion prospects. Five-day week with four weeks' and two days' leave a year initially. Special allowance in addition to salary during overseas service. Qualifications and experience:

(i) (a) University degree or equivalent diploma in electrical and/or mechanical engineering with at least two years' apprenticeship; or

(b) Graduate or corporate member of I.E.E. with at least three years' apprenticeship; or

(c) Graduate or corporate member of I.Mech.E., appreciable electrical engineering experience with at least three years' apprenticeship; and

(ii) Have been employed for minimum of two years with well established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects between ages of 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D.158/OA. (S 14)

THE SOUTH WALES ELECTRICITY BOARD

MANAGER—WEST WALES AREA

APPLICATIONS are invited for the post of Manager of this Area, based at Tenby, which covers the whole of Pembrokeshire, Southern Cardiganshire, and the greater part of Carmarthenshire, and comprises a very large rural area in which much development remains to be done. Some industrial development can also be anticipated, particularly in the Milford Haven area of Pembrokeshire.

Managerial experience in the Electricity Supply Industry is essential and applicants should possess a recognised professional qualification.

The scale of salary applicable to the post (in accordance with the scale of the National Joint Managerial and Higher Executive Grade Committee) will be £2,815/£3,040. The successful candidate will be required to commence duty on 1 March, 1961.

Applications should be sent to the undersigned marked "Manager—West Wales Area" by Monday, 31 Oct., 1960.

R. G. WILLIAMS,
Secretary.
(S 174)

THE EAST MIDLANDS ELECTRICITY BOARD
Leicestershire & Warwickshire Sub-Area
GENERAL ASSISTANT ENGINEER
(ENGINEERING DRAUGHTSMAN)
Vacancy No. 63/60.

SALARY: N.J.B. Class K, Grade 16 (£715/£805 per annum), or Class K, Grade 15 (£765/£870 per annum) according to qualifications and experience.

The duties will include the preparation of drawings and diagrams relating to substation plant and equipment.

A technical qualification at least equivalent to the Ordinary National Certificate in Electrical Engineering and a knowledge of building construction would be an advantage.

Applications giving details of age, present position and salary, qualifications and experience should be addressed to The Manager, Leicestershire and Warwickshire Sub-Area, Upper Bond St, Hinckley, within 14 days of the date of this advertisement. (S 185)

THE SOUTH WALES ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for the position of General Assistant Engineer in the East Monmouthshire District of the Monmouthshire and Mid-Wales Area of the Board at Cwmbran.

The District comprises approximately 270 sq miles of urban and rural areas with large industrial and domestic supplies, and the post would be particularly suitable for a young engineer with a Higher National Certificate in electrical engineering and some practical experience of distribution work.

Salary: N.J.B. Class G, Grade 11, Scale 5, £825/£940 per annum.

The successful applicant may be able to obtain housing accommodation in the Cwmbran New Town after a reasonable waiting period.

Applications stating age, present position, present salary, qualifications and experience should be addressed to D. G. Gwyn, B.SC., A.M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llywelyn Rd, Cwmbran, Mon, to arrive not later than 15 Oct., 1960. Please quote reference 181/60/ET, endorsing envelope "General Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(S 154)

BOROUGH OF WILLESDEN
Borough Engineer and Surveyor's Department

APPLICATIONS are invited for the appointment of:
SENIOR ELECTRICAL ENGINEERING ASSISTANT

Salary within A.P.T. Grade V, £1,220/£1,375 p.a., plus London Weighting maximum £45.

Candidates must possess appropriate qualifications and should have experience in the design of electrical installation in multi-storey blocks of flats and public buildings.

The Council cannot assist with housing.

Full details and form of application may be obtained from the Borough Engineer and Surveyor, Town Hall, Dyne Rd, Kilburn, N.W.6, and must be returned to the undersigned not later than 10 a.m. on Monday, 10 Oct., 1960.

R. S. FORSTER,
Town Clerk.
(S 166)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

KENYA GOVERNMENT

TECHNICAL INSTRUCTOR (ELECTRICAL)

REQUIRED by Education Department. Appointment either on probation to permanent and pensionable establishment or on contract for one tour with gratuity at rate 13½% of total salary drawn. Normal tour 36/45 months. Commencing salary according to age and experience up to maximum, in scale (including Inducement Addition) rising to £1,341 a year. Outfit Allowance £40. Free passages. Liberal leave.

Candidates, under 45 years of age, must possess C. and G. Final Certificate or O.N.C. in Electrical Engineering and have had practical experience. Teaching experience desirable. Duties will be teaching students taking C. and G. and O.N.C. courses in the Kenya Polytechnic, Nairobi.

Write to the Crown Agents, 4 Millbank, London S.W.1. State age, name in block letters, qualifications and experience and quote M2A/51021/EE. (S 147)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMEN (TWO)

APPLICATIONS are invited for the above positions at Woolwich, S.E.18.

Candidates should have a good general and technical education and be in possession of the Ordinary National Certificate, be neat and capable draughtsmen and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey or recording of mains work. A knowledge of building construction would be an advantage.

Pending determination as to the grading of the posts within Schedule A of the National Joint Board Agreement, the salary will be in the provisional range £755 per annum rising to £855 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 14 days of the publication of this notice. Please quote ref.: PER/V/3098/T. (S 159)

THE GOVERNMENT OF NORTHERN NIGERIA

REQUIRES **INSPECTORS OF WORKS (MECHANICAL)** on favourable contract terms.

Qualifications:

Candidates should be fully experienced in the operation, maintenance and overhaul of all kinds of road construction plant and commercial vehicles of all types. Experience should include machine shop practice as particularly applied to overhaul of petrol and compression ignition engines and automobile electrical apparatus. Preference will be given to candidates possessing a City and Guilds Certificate in vehicle technology.

Duties:

The maintenance and overhaul of road construction plant both in workshops and in running repairs on the job. Candidates should be prepared to live in temporary quarters on a construction site.

Emoluments:

1. SALARY. According to amount of experience in the range of £906/£1,554.

2. OUTFIT ALLOWANCE of £45 and Camp Equipment Allowance of £40 on first appointment.

3. RESETTLEMENT GRANT of £25 or £37 10s for each three months' service inclusive of earned leave payable on satisfactory completion of contract.

4. CHILDREN'S ALLOWANCE of £120 for one child, £216 for two and £288 for three children eligible.

5. FIRST-CLASS PASSAGES for officer and wife on appointment and on leave, and assistance towards cost of children's passages.

Leave:

Generous home leave on full pay.

Applicants should write to: The Recruitment Secretary (Overseas), Northern Region Recruiting Agency, Nigeria Hse, 9 Northumberland Ave, London W.C.2, or telephone TRAfalgar 1244. Extension 145. (S 156)

LONDON ELECTRICITY BOARD

DRAUGHTSMAN

APPLICATIONS are invited for the above position at Ilford, Essex.

Applicants preferably should be not less than 21 years of age and have had some experience in mains recording, preferably with an Electricity Board, and be able to obtain particulars on site and compile neat and accurate permanent records.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 2, £700 £775 per annum, plus the appropriate London Area Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref.: PER/V/3072/T. (S 160)

THE NORTH EASTERN ELECTRICITY BOARD

ASSISTANT CHIEF COMMERCIAL OFFICER

APPLICATIONS are invited for the appointment of Assistant Chief Commercial Officer at Area Board Headquarters.

The successful applicant will be responsible for the development of supplies to commercial, domestic and farming consumers, including specialised utilisation by these classes of consumers. He will also have control of publicity and will be required to assist in sales staff training. Another important aspect of the appointment is a functional interest in service centres, testing of appliances and public lighting.

Applicants should have a wide experience in the commercial organisation of the electricity supply industry and preferably be corporate members of the Institution of Electrical Engineers.

Conditions of service according to National Joint Managerial and Higher Executive Grades Committee Agreement for the Electricity Supply Industry. Salary scale: Class B, Grade 8, £2,595/£2,815 per annum, according to qualifications and experience. There is a compulsory contributory superannuation scheme.

Applications, marked "Confidential," should be submitted to the Secretary, The North Eastern Electricity Board, Carliol Hse, Newcastle upon Tyne 1, not later than 10 Oct., 1960. (S 106)

CITY OF SALISBURY

Southern Rhodesia

VACANCY FOR ELECTRICAL ENGINEER

SALARY: £1,025/£1,768 2s 6d

APPLICATIONS are invited for the post of Electrical Engineer in the Salisbury Municipal Electricity Department, on the above scale.

Commencing salary is based on qualifications and experience, with a barrier at £1,563 2s 6d per annum, above which no engineer can rise without being a corporate member of the British Institution of Electrical Engineers, and £1,614 7s 6d per annum is the maximum entry point into the grade.

Candidates must be graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree.

Experience in the design and planning of distribution networks and substations from L.T. 11 kV and up to and including 33 kV, the preparation of technical specifications and the compiling of investigatory reports on general distribution problems, together with general experience on mains and substation construction works on a large undertaking is essential.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital status should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Messrs Davis and Soper Ltd., 52-54 St. Mary Axe, London E.C.3, to whom applications must be submitted on or before 15 Oct., 1960. (S 86)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

THIRD ASSISTANT ENGINEER (STATISTICS)

REQUIRED in the Generation Operation Department at Divisional Headquarters, Birmingham. Salary will be in accordance with the Common Salary Scales of the National Joint Board Agreement, Schedule BX, Grade 8, Scale 11, within the range £1,105/£1,410 per annum.

Applicants should have a good knowledge of the industry and possess a Higher National Certificate in electrical and/or mechanical engineering or an equivalent qualification. Previous investigational experience is desirable, and evidence of an inquiring mind and of an aptitude for logical reasoning will be an advantage.

Apply quoting vacancy number 259/60MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13. Closing date for receipt of applications: 10 Oct., 1960. (S 161)

THE NORTH WESTERN ELECTRICITY BOARD

SENIOR DEMONSTRATOR
BURY DISTRICT

APPLICANTS must have had a good education with training in Domestic Science and should hold the E.A.W. Diploma. The person appointed will be required to give lectures and demonstrations on all types of domestic appliances, advise consumers on the choice of equipment, and must be capable of supervising staff.

Salary scale: £700 x £25—£775 p.a., Grade 2. N.J.C. Conditions.

Application forms to be obtained from the Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, and returned to him by 10 Oct., 1960.

SECOND ASSISTANT DISTRICT
COMMERCIAL ENGINEER
(TECHNICAL SALES AND SERVICE)
STOCKPORT DISTRICT

Applicants should be capable of handling enquiries on industrial and commercial tariff matters and giving electro-technical advice to industrial and commercial consumers on the most economical and efficient utilisation of electricity.

Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary scale: £1,115/£1,245 p.a., Grade G.7. N.J.B. Conditions.

Application forms to be obtained from the Manager, No. 3 Sub-Area, The North Western Electricity Board, Union St, Oldham, and returned to him by 10 Oct., 1960. (S 149)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

APPLICATIONS are invited for the following appointment in the Midlands Project Group at Bourneville.

THIRD ASSISTANT ENGINEER
(MECHANICAL)
Vacancy No. MPG.69/60.

Salary: Grade 7, Scale 13 (£1.285/£1.610 per annum). Applicants should hold a Higher National Cetrificate in Mechanical Engineering or equivalent qualification and should have experience in the design, manufacture and installation of modern power station mechanical plant.

Duties will involve the preparation of specifications, examination of tenders, and general contract development work and correspondence.

Applications should be made on standard form AE6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham 30, and should be returned to him not later than 10 Oct., 1960.

Envelopes should be marked "Confidential" quoting Staff Vacancy Notice Number MPG. 69/60. (S 153)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

EASTERN ELECTRICITY BOARD

Norfolk Sub-Area

THIRD ASSISTANT ENGINEER
KING'S LYNN AND WESTERN DISTRICT
258/60.R

CANDIDATES should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class F, Grade 9 (£890/£1,015).

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Apply by letter to the Manager, King's Lynn and Western District, Eastern Electricity Board, Gaywood Bridge, King's Lynn, Norfolk, by 14 Oct., 1960. (S 183)

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

THIRD ASSISTANT ENGINEER
(SYSTEM STANDARDISATION)

APPLICANTS should have technical qualifications equivalent to Graduate Membership of the Institution of Electrical Engineers and should have had experience on high-voltage electrical distribution systems.

Salary: N.J.B. Class N (Notional), Grade 10 (Scale 12), £1.350/£1,500 per annum.

FOURTH ASSISTANT ENGINEERS
(CONSTRUCTION) (TWO POSTS)

Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent.

They should have had experience in the design and layout of substations, routeing of underground and overhead mains and the supervision of site erection work. A knowledge of modern protective systems, layouts of 66 kV or 33 kV substations, plant specifications and handling of contracts will be an advantage.

Salary: N.J.B. Class N (Notional), Grade 13 (Scale 9), £1,115/£1,245 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield 1, not later than 14 Oct., 1960.

No. 1 (Bradford) Sub-Area

ENGINEERING DRAUGHTSMAN
(CIVIL AND BUILDING)

Applicants should have had a good general and technical education. The duties of the post will include the preparation, under regular supervision, of final or working drawings in respect of substations, offices, building alterations, etc. Candidates should have had drawing office experience in the preparation of such drawings.

Salary: N.J.B. Scale 3, £715/£805 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 14 Oct., 1960.

No. 7 (Grimsby) Sub-Area

GRIMSBY DISTRICT
SENIOR SERVICE CENTRE ASSISTANT

Applicants should have experience of general Service Centre duties including the sale of electrical appliances, handling of consumers' enquiries and associated general clerical work. The successful applicant will be responsible for the Service Centre in the absence of the Service Centre Supervisor.

Salary: N.J.C. Grade 2, £700/£775 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 14 Oct., 1960. (S 191)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

Vacancy No. ET/129/60.
MAINTENANCE ENGINEER (ELECTRICAL)

REQUIRED at East Yelland Power Station.

Superannuation Scheme. Salary: N.J.B. Class H, Grade 6, Scale 11, £1,275/£1,410 per annum.

Applicants should have had a wide experience in the maintenance of Modern Generating Plant. Associate Membership of appropriate Engineering Institution or equivalent desirable.

Vacancy No. ET/131/60.
SHIFT CHARGE ENGINEER

Required at Castle Meads Power Station, Gloucester.

Superannuation Scheme. Salary: N.J.B. Class E, Grade 7, Scale 7, £965/£1,090 per annum plus 10% shift allowance.

Applicants should have had considerable experience in modern power station operation.

Graduate or Corporate Membership of a recognised Engineering Institution or equivalent desirable.

Previous applicants need not re-apply.

Vacancy No. ET/132/60.
ASSISTANT SHIFT CHARGE ENGINEER

Required at Newton Abbot Power Station.

Superannuation Scheme: Salary: N.J.B. Class F, Grade 9, Scale 6, £890/£1,015 per annum plus 10% shift allowance (minimum £90).

Applicants should possess good technical qualifications and should have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Applications on form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 10 Oct., 1960. (S 186)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments in the South Wales Division:

THIRD OR FOURTH ASSISTANT ENGINEER
SYSTEM DESIGN SECTION
TECHNICAL DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 251/ET/60.
THIRD ASSISTANT ENGINEER

Salary: AX.6 (£1,285/£1,500); AX.7 (£1,200/£1,410); or AX.8 (£1,105/£1,325); according to experience and qualifications.

FOURTH ASSISTANT ENGINEER

Salary: AX.9 (£1,005/£1,245); AX.10 (£935/£1,165); or AX.11 £855/£1,090); according to qualifications, ability and experience.

The Section is concerned with the investigation of schemes for the extension of the Main Transmission system in South Wales and has to deal with a wide variety of power system problems including load flow studies, fault investigations and the analysis of system behaviour. The Section has at its disposal a D.C. calculating board and an A.C. Network analyser.

Candidates should have a University degree or Higher National Certificate, and some practical experience in the Supply or Manufacturing Industries would be an advantage.

Re-advertisement

ASSISTANT MAINTENANCE ENGINEER (M)
LLYNFI POWER STATION
ABERKENFIG, Nr. BRIDGEND, GLAM
Vacancy No. 252/ET/60.

Schedule A, Class G, Grade 8, Scale 8 (£1,040/£1,165 per annum).

Applicants should have experience in the maintenance of heavy plant and possess H.N.C. or equivalent qualifications.

Previous applicants need not re-apply.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 14 Oct., 1960. (S 182)

THE NORTH EASTERN ELECTRICITY BOARD

Appointment of Purchasing Officer

APPLICATIONS are invited for the appointment of Purchasing Officer at the Board's Headquarters, Carliol Hse, Newcastle upon Tyne. The vacancy arises because of the impending retirement of the Board's Purchasing Officer, who is responsible to the Board for the negotiation of substantial contracts for the supply of electrical plant and equipment, cables, electrical appliances for resale and a wide range of other materials and services. Knowledge of the plant, equipment and other materials used in the distribution of electricity together with the ability to conduct negotiations at high level are essential qualifications.

Conditions of service of the National Joint Managerial and Higher Executive Grades Committee Agreement for the Electricity Supply Industry will apply. Salary: Class B, Grade 8, viz, £2,595 per annum to £2,815 per annum.

Applications marked confidential should be addressed to The Secretary, The North Eastern Electricity Board, Carliol Hse, Newcastle upon Tyne 1, so as to arrive within ten days of the appearance of this advertisement. (S 181)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

FOURTH ASSISTANT ENGINEER
TECHNICAL DEPARTMENT
(PROTECTIVE GEAR AND ELECTRICAL PLANT TESTING SECTION)

APPLICATIONS are invited for the above-mentioned appointment with headquarters at Newcastle upon Tyne.

Applicants should be adaptable and have had experience of protective relays or schematic/circuit diagrams for automatic schemes.

Technical qualifications leading to Graduate I.E.E. standard and experience in a manufacturer's works would be considered an advantage.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Grade 9 (£1,005/£1,245 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 16 Oct., 1960. (S 148)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (LOCAL)
(Z.1256)

NEWBURY District of No. 2 (Newbury) Sub-Area, located at Andover. Salary N.J.B. Class F, Grade 11 (£765/£870 per annum). N.J.B. Conditions of Service.

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution equipment and possess suitable technical qualifications.

ASSISTANT ENGINEER (LOCAL)
(Z.1255)

Newbury District of No. 2 (Newbury) Sub-Area, located at Marlborough. Salary N.J.B. Class F, Grade 12 (£715/£805 per annum). N.J.B. Conditions of Service.

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead underground distribution equipment and possess suitable technical qualifications.

Applications for each of the above appointments on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury, Berks, and returned to him quoting the appropriate Z Number, not later than 10 Oct., 1960.

Successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (S 190)

LONDON ELECTRICITY BOARD

VACANCIES:

ASSISTANT DISTRIBUTION ENGINEERS

APPLICATIONS are invited for the above positions at Bethnal Green, E.2. (Ref. PER/V/3101) and at Shepherds Bush, W.12 (Ref. PER/V/3103).

Applicants should have had a sound technical education to the standard of the Higher National Certificate, and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

The posts are graded under Schedule A of the National Joint Board Agreement as Class H, Grade 9, £1,090 per annum rising to £1,215 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote appropriate reference. (S 188)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

FIRST ASSISTANT STATION CHEMIST
NORTHAMPTON POWER STATION
Vacancy No. 221/60.

APPLICATIONS are invited for the position of First Assistant Station Chemist at Northampton Power Station, Houghton Rd, Northampton.

Previous experience in a power station laboratory is essential and candidates should, at least, hold the H.N.C. in Chemistry. Candidates must be familiar with methods of sampling and analysis of coal, oil and water and with the interpretation and application of analytical results.

Salary will be in accordance with Class G, Grade 9 (£965/£1,090 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 5 Oct., 1960.

ASSISTANT MAINTENANCE ENGINEER
(ELECTRICAL)
CASTLE DONINGTON POWER STATION
Vacancy No. 226/60.

Applications are invited for the position of Assistant Maintenance Engineer (Electrical) at Castle Donington Power Station, nr. Derby.

Applicants should have received a thorough technical and practical training with experience in maintenance of alternators, transformers, switchgears and associated equipment.

Preference will be given to candidates who hold a recognised qualification.

Salary will be in accordance with Class L, Grade 8 (£1,350/£1,500 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 7 Oct., 1960.

GENERAL ASSISTANT ENGINEER
WILLINGTON POWER STATION
Vacancy No. 222/60.

Applications are invited for the position of General Assistant Engineer at Willington Power Station, P.O. Box No. 27, Derby.

Candidates should be suitably qualified young men who are interested in power station operation and/or maintenance as a career.

Facilities are available whereby experience can be obtained in all sections of a large modern power station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend on qualifications and knowledge and will be within the range £625/£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 7 Oct., 1960.

GENERAL ASSISTANT ENGINEER
(CHEMIST) (MALE OR FEMALE)
WILLINGTON POWER STATION
Vacancy No. 223/60.

Applications are invited for the position of General Assistant Engineer at Willington Power Station, P.O. Box No. 27, Derby.

Candidates must have had a sound technical training and previous laboratory experience and should preferably hold the

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Higher National Certificate in Chemistry, but consideration will be given to candidates studying for that qualification.

The salary will be within the range £625/£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 7 Oct., 1960.

STATION SHIFT CONTROL ENGINEER
DERBY POWER STATION
Vacancy No. 218/60.

Applications are invited for the position of Station Shift Control Engineer at Derby Power Station, Full St, Derby.

Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be an advantage.

Salary will be in accordance with Class F, Grade 10 (£825/£940 per annum) of the National Joint Board Agreement plus £90 per annum shift enhancement.

Closing date for receipt of applications: 7 Oct., 1960.

STATION CHEMIST
COVENTRY POWER STATION
Vacancy No. 225/60.

Applications are invited for the position of Station Chemist at Coventry Power Station, Alderman's Green, Coventry.

Previous experience in a power station laboratory an advantage and candidates should preferably be Associates of the Royal Institute of Chemistry or hold equivalent qualifications. The successful candidate will be required to take charge of the laboratory, the function of which include the analysis of coal, oil, water and other substances and the control of water softening plant.

Salary will be in accordance with Class G, Grade 7 (£1,115/£1,245 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 15 Oct., 1960.

SHIFT CHARGE ENGINEER
DRAKELOW "A" POWER STATION
Vacancy No. 229/60.

Applications are invited for the position of Shift Charge Engineer at Drakelow "A" Power Station, nr. Burton-on-Trent, Staffs.

Candidates should be suitably qualified and have had experience with large capacity high-pressure turbo-alternators and pulverised fuel-fired boilers.

Applicants should be in possession of technical qualifications admitting to Corporate Membership of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers.

Salary will be in accordance with Class J, Grade 6 (£1,350/£1,500 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 15 Oct., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official AE6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to the Station by the date stated.

FOURTH ASSISTANT ENGINEER
COVENTRY SECTION
Vacancy No. 224/60.

Applications are invited for the position of Fourth Assistant Engineer at Coventry Transmission Section, Victoria Mills, Bulkington, nr. Nuneaton.

Applicants should have experience of maintenance and operation of E.H.T. overhead lines, transformers and switchgear.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

The salary will be in accordance with Class BX, Grade 11 (£855/£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 7 Oct., 1960.

This appointment will be pensionable

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within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Section Engineer, Coventry Transmission Section, Victoria Mills, Bulkington, nr. Nuneaton, and should be returned to the Transmission Section by the date stated.

O. S. WOODS,
Divisional Controller.
23 Sept., 1960. (S 192)

THE SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Assistant Engineer in the Pontardawe and Ammanford District of the Swansea and West Central Area of the Board.

The District covers 150 square miles, serves 23,000 consumers, has a distribution system which is mainly overhead, and also has an appreciable industrial load. The successful applicant will be required to undertake a wide variety of engineering duties, and the post would be well suited to an engineer, preferably possessing the Higher National Certificate in Electrical Engineering, who wishes to obtain more varied experience.

Salary: N.J.B. Class F, Grade 9, Scale 6 (£890/£1,015).

Applications stating age, present position, present salary, qualifications and experience should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., Manager, Swansea and West Central Area, 29 Ystrad Rd, Swansea Industrial Estate, Swansea, Glam. to arrive not later than 15 Oct., 1960. Please quote reference 182/60/ET endorsing envelope "Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(S 165)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the undernoted superannuable appointments in the Generation/Operation Section of the Chief Engineer's Department at Board Head Office:

1. SECOND ASSISTANT ENGINEER
(Ref. E36/60.)

The successful candidate will be required to undertake technical and administrative duties associated with the operation of the Board's generating stations. Operational experience in a generating station would be desirable.

Applicants should, preferably, possess Corporate Membership of the Institution of Electrical Engineers or the Institution of Mechanical Engineers.

Salary: N.J.B. Class AX, Grade 5, £1,375/£1,610 per annum.

2. THIRD ASSISTANT ENGINEER
(STATISTICS) (Ref. E34/60.)

Candidates should have had a good technical education preferably with qualifications for admission to corporate membership of a recognised Institution.

The successful candidate will be responsible for the production of generation statistics. Some experience in generating station operation or system control would be an advantage.

Salary: N.J.B. Class AX, Grade 6, £1,285/£1,500 per annum.

Applications, quoting appropriate reference, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 14 Oct., 1960. (S 168)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

South Staffs & North Worcs. Sub-Area

GENERAL ASSISTANT ENGINEER
(COMMERCIAL DEPARTMENT)
(HEADQUARTERS)

Applicants should have had experience in the installation of electrical equipment and of preparatory work connected therewith. The successful applicant will be required to assist in all branches of the Department, particularly in the planning and installation of space heating equipment for all purposes. Possession of O.N.C. (Electrical) essential. Salary: £825/£940 per annum (N.J.B. Grade M.16). Apply by letter within 14 days, stating age, experience, present position and salary to Mr H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 9, Toll End Rd, Tipton, Staffs.

Wolverhampton & District Sub-Area

THIRD ASSISTANT DISTRICT ENGINEERS
(THREE) (WOLVERHAMPTON)

Duties will include the construction, maintenance and operation of H.V. and L.V. underground mains, overhead lines and substations, also planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary: £1,115/£1,245 per annum (N.J.B. Grade J.9). Apply by letter within 14 days, stating age, experience, present position and salary to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

Worcester & District Sub-Area

WAYLEAVE OFFICER
(REDDITCH/BROMSGROVE)

Duties include plotting of routes and the negotiation and preparation of Wayleave Agreements, etc. Salary: £700/£775 per annum (N.J.C. Grade 2). Apply by letter within 14 days, stating age, experience, present position and salary to District Manager, Midlands Electricity Board, Windsor Rd, Redditch.

F. W. CATER,
Secretary.
(S 171)

SOUTH EASTERN ELECTRICITY BOARD

FIRST ASSISTANT COMMERCIAL ENGINEER
MAIDSTONE DISTRICT

SALARY under N.J.B. Class F, Grade 5, Scale 10, £1,190/£1,325 per annum with progression to Grade 4 (maximum salary £1,410) subject to satisfactory service. Superannuable. Successful candidate will be responsible to the District Commercial Engineer and will be required to assist him in all the work of a commercial department, in particular tariffs, development and large contracting installations. Applicants should be suitably qualified and preferably corporate members of the I.E.E.

Applications quoting ET and naming two referees to District Manager, Seeboard, Fairmeadow, Maidstone, by 12 Oct., 1960.

ASSISTANT DISTRICT ENGINEER
(DRAUGHTSMAN)
WEST KENT DISTRICT

Salary £1,015/£1,140 per annum including London Allowance under N.J.B. G.9 (Scale 7). Superannuable. Applicants should be suitably qualified and capable of supervising a drawing office under the District Engineer. Experience in basic design, layout of substations up to 11 kV, presentation of data and mains and system records is essential.

Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 286 High St, Orpington, Kent, by 12 Oct., 1960.

DISTRICT ENGINEER
GUILDFORD DISTRICT

The appointment will be made at N.J.B. Class F, Grade 3, £1,350/£1,500 p.a. with progression to Grade 2 (maximum salary £1,610) subject to satisfactory service. Superannuable. Consideration will be given to a car allowance and assistance with house purchase. Applicants, who should preferable be corporate members of the Institution of Electrical Engineers, must have had

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a wide experience of all aspects of distribution engineering and be competent to control an engineering department.

Applications quoting ET and naming two referees on forms from Surrey Manager, Seeboard, Rough Rew, Ridgeway Rd, Dorking, by 12 Oct., 1960.

SENIOR COMMERCIAL ASSISTANT
CROYDON AND PURLEY DISTRICT

Salary £934 10s rising to £1,060 per annum, including London Allowance, under N.J.C. Grade 4. Superannuable. Applicants must be able to advise on all electrical aspects of industrial supply and the possession of the H.N.C. in electrical engineering will be an advantage.

Applications quoting ET and naming two referees on forms from District Manager, Seeboard, Electric Hse, Wellesley Rd, Croydon, by 12 Oct., 1960.

DISTRICT SENIOR COMMERCIAL
ASSISTANT (SALES)
SUTTON DISTRICT

Salary £1,150 x £30—£1,240 per annum plus London Weighting under N.J.C. Grade 6. Superannuable. The successful applicant will be responsible for the co-ordination of the seven showrooms in the District, stocking of major appliances, sales promotion, the control of outside representatives and demonstrators, the direction of sales campaigns, exhibitions and publicity and other general commercial duties.

Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 52 High St, Sutton, Surrey, by 12 Oct., 1960.

GEORGE WRAY,
Secretary.
(S 187)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

Vacancy No. 161A/60T.

FOURTH ASSISTANT ENGINEER
(SYSTEM DESIGN AND PLANNING)
DIVISIONAL HEADQUARTERS

CANDIDATES should possess a degree in Electrical Engineering or equivalent qualification leading to Graduate membership of the I.E.E., and should be interested in System Design, load flow and fault current calculations involving the use of A.C. and D.C. network analysers.

N.J.B. Conditions of Service and salary including London Allowance, Class AX, Grade 11, £905/£1,140 per annum, with prospect of promotion subject to satisfactory progress.

Applications giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 11 Oct., 1960.

W. H. DUNKLEY,
Divisional Controller.
(S 170)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT INSTALLATION INSPECTION ENGINEER

REQUIRED in the Liverpool Central District of the Board's No. 1 Sub-Area.

Salary within range £965/£1,090 per annum (N.J.B. J/11).

Applicants should have had wide experience in the testing and inspection of all types of domestic, commercial and industrial installations, and have knowledge of the regulations covering these installations. Experience in the installing and connecting of single phase and polyphase metering equipment is required. Candidates should possess suitable technical qualifications.

Appointment subject to medical examination. Pension Scheme.

Special application forms, available from the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, should be completed and returned not later than 11 Oct., 1960.
(S 193)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Re-Advertisement

Vacancy No. 250/ET/60.

APPLICATIONS invited for superannuable N.J.B. appointment of ASSISTANT MAINTENANCE ENGINEER (ELECTRICAL) at TIR JOHN POWER STATION, PORT TENNANT, SWANSEA.

Salary: Class H, Grade 9, Scale 8, £1,040/£1,165 per annum.

Applicants should possess H.N.C. or equivalent qualifications and should have had wide experience in power station electrical maintenance.

Previous applicants need not re-apply.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 14 Oct., 1960. (S 184)

THE SOUTH WALES ELECTRICITY BOARD

MANAGER—WEST WALES AREA

APPLICATIONS are invited for the post of Manager of this Area based at Tenby, which covers the whole of Pembrokeshire, Southern Cardiganshire, and the greater part of Carmarthenshire, and comprises a very large rural area in which much development remains to be done. Some industrial development can also be anticipated, particularly in the Milford Haven area of Pembrokeshire.

Managerial experience in the Electricity Supply Industry is essential and applicants should possess a recognised professional qualification.

The scale of salary applicable to the post (in accordance with the scale of the National Joint Managerial and Higher Executive Grades Committee) will be £2,815/£3,040. The successful candidate will be required to commence duty on 1 March, 1961.

Applications should be sent to the undersigned marked "Manager—West Wales Area," by Monday, 31 Oct., 1960.

R. G. WILLIAMS,
Secretary.
(S 152)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

THIRD ASSISTANT ENGINEER
EFFICIENCY AND TESTING SECTION

APPLICANTS are invited for the position of Third Assistant Engineer in the Efficiency and Testing Section of the Generation Operation Department, Yorkshire Divisional Headquarters, Leeds.

Applicants should be educated to at least Higher National Certificate standard in Mechanical Engineering and should have had experience of operation of modern power stations.

The successful applicant will be responsible for carrying out tests, investigations and efficiency studies on power station plant throughout the Division. He will be based at Skelton Grange Power Station but will be expected to travel in connection with his duties.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Grade 6BX, Schedule B, £1,285/£1,610 per annum.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel) Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 31 Oct., 1960. (S 167)

LONDON ELECTRICITY BOARD

VACANCY:
GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for the above position. Initially the successful candidate will be located at Bethnal Green, E.2.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the Electricity Industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the post within the National Joint Board Agreement, the provisional minimum salary will be £685 per annum rising to £855 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref. PER/V/3102/T. (S 189)

BRITISH Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. ELECTRICAL SURVEYOR required in Scotland. Permanent position carrying progressive salary scale, £800/£1,100, and non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (S 178)

CONTRACT and ASSISTANT ENGINEERS required by London Contractor. Experience of estimating, control of labour, cabling and industrial installation schemes. Permanent and progressive positions offering good remuneration and fringe benefits including pension scheme.—Write giving full particulars of age and experience to Box No. 7993, Electrical Times. (S 23)

Electrical Power Engineers' Association

MIDLAND AREA SECRETARY

The National Executive Council of the Electrical Power Engineers' Association invites applications for the appointment of an Area Secretary to operate in the Midlands and to reside in or near Birmingham.

Applicants should be under 45 years of age and preferably should have had experience on the technical or administration staff in the electricity supply industry with knowledge of the national agreements in the industry governing salaries and conditions of employment. The position being primarily concerned with labour relations, the successful applicant will be responsible for the personal conduct of negotiations at local level between staff and management and will need to possess the ability to approach management, present claims and address meetings.

Out-of-pocket expenses and N.J.B. car allowance provided. Contributory staff pension fund. Salary within range £1,350/£1,720.

Apply, giving full details of education, experience including voluntary work, before 3 Oct., 1960, to General Secretary, Electrical Power Engineers' Association, 102 St. George's Sq, London S.W.1. (S 156)

SUPERVISING TEST ENGINEER

for

DOMESTIC APPLIANCE LABORATORY

A leading electrical Domestic appliance manufacturer requires the services of an experienced engineer to head their test laboratory. This is a senior appointment in the salary range £1,600-£2,000 p.a. and qualified candidates must have had previous experience of designing suitable test rigs, conducting and supervising tests and preparation of reports, on experimental and prototype appliances, including component testing of all types of electrical, mechanical and hydraulic controls, refrigeration systems, etc.

Whilst the successful candidate should ideally have had experience in all these fields, it is appreciated that previous experience may have been limited to one product, i.e. washing machines, cookers or refrigerators, and the advertiser is prepared to consider applications from such men who have the initiative and ability to master other fields.

Write, giving full details of qualifications and experience, in strictest confidence, to Box No. 8013, Electrical Times. (S 162)

CROMPTON PARKINSON LTD. require TWO SALES ENGINEERS for special duties in their Overseas Division, London. These duties will include liaison between home and overseas factories and the Company's world-wide marketing organisation and general assistance in the sales promotion of the Company's Switchgear, Transformers, and Rotating Plant Products. One appointment will be for Switchgear and Transformers and the second for Rotating Machines. Really go-ahead young men will find excellent opportunities through these appointments. Applications, including details of education, experience and salary required should be sent to Ref. XS, Crompton Hse, Aldwych, London W.C.2. (S 196)

CABLE JOINTERS required for work up to 11 kV in Cardiff area. Send brief details, age, experience, etc., to Box No. 8011, Electrical Times. (S 145)

ELECTRICAL CONTRACTORS require SITE AGENT/FOREMAN with experience in H.T. and L.T. cabling, copper busbar erection, etc. Please write giving full details to Box No. 8005, Electrical Times. (S 83)

ELECTRICAL DRAUGHTSMAN able to apply himself to a wide variety of work. A knowledge of power switchboard construction would be an advantage.—Astral Switchgear Ltd., Alma Rd, Ponders End, Middlesex. (S 99)

ELECTRICAL DRAUGHTSMEN

Expansion of Building Programme

NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

Electrical Draughtsmen required.

These posts are permanent and pensionable and offer career prospects owing to the vast expansion of the Hospital Building Programme. In suitable cases financial assistance may be given towards expenses in obtaining recognised qualifications. Those appointed will be members of a team designing the Engineering Services for new hospitals, extensions, etc. They will work under the general control of an experienced professional engineer. The work is complex in nature and extremely interesting and offers a challenge to the draughtsman who wants more than the usual run of job.
Applicants for the posts of Engineering Draughtsmen Grade I and Grade II should preferably have the Higher National Certificate in Electrical Engineering, but applications will be considered from those not holding this qualification. Applications for Engineering Draughtsmen Grade III posts will be considered from those who have had three years' practical and theoretical training and who are desirous of entering the field of design as distinct from installation-on-site work. Those appointed will normally be engaged on the design of engineering works and be responsible for the preparation of Tender Drawings and Specifications under the direction of an electrical engineer.

Salaries
Engineering Draughtsmen I—£1,030 x 35(2) x 50(3)—£1,250
Engineering Draughtsmen II—£870 x 35(4)—£1,010
Engineering Draughtsmen III—£550 x 25(2) x 30(6) x 35(2)—£850
London Weighting of £20-£50 to be added to above scales.

APPLY, stating age, qualifications (with dates) and experience, with names of two referees, to the Secretary, North West Metropolitan Regional Hospital Board, 40 Eastbourne Terrace, London W.2, quoting reference number 850. Enquiries by telephone or visit by appointment to the Board's headquarters offices would be welcome. Tel AMBassador 8011, Ext. 325. (S 179)

AEI

Associated Electrical Industries Limited
Transformer Division

SALES ENGINEERS

There are several vacancies for Sales and Contracts Engineers at Wythenshawe. The preferred technical qualifications would be a recognised engineering apprenticeship with at least H.N.C.

The posts call for a mature personality, common sense outlook and the ability to carry a job through to its final conclusion. A good command of English would be an added advantage.

The works are situated at Wythenshawe on the south side of Manchester in attractive surroundings. Good facilities are available and these are staff positions qualifying for the Company's pension scheme.

Please write for application form quoting reference U.16 to:

PERSONNEL MANAGER,
ASSOCIATED ELECTRICAL INDUSTRIES
(MANCHESTER) LTD.,
TRAFFORD PARK, MANCHESTER 17. (S 151)

ELECTRICAL SUPERVISING or ESTIMATING ENGINEER used to industrial contracts, required for Cardiff Branch of Drake and Gorham (Contractors) Ltd. Write giving details of experience, etc., to 13 St. Andrew's Cres, Cardiff. (S 116)

ELECTRICAL ENGINEER required for Glasgow Office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. (S 177)

EDITORIAL POST on the staff of "Science Abstracts," Section B "Electrical Engineering." Engineering or science degree, or corresponding qualification, and some knowledge of most branches of Electrical Engineering. Acquaintance with foreign languages essential and experience of a research or design department, or of information work connected with such, is desirable. Commencing salary of the order of £1,000, plus or minus an amount to be determined according to age, qualifications and experience. Progressive post. Pension Scheme. Apply Secretary, I.E.E., Savoy Pl, W.C.2. (S 197)

ENGLISH ELECTRIC CONTROL GEAR

Excellent opportunities await the right men in this new and expanding Division which has been created to provide a control engineering service capable of exploiting all modern techniques and components.

Opportunities are available for engineers experienced in conventional industrial control gear to extend their knowledge by working on the latest techniques developed by the Company in the field of Static Control.

There are also opportunities on the commercial side, and details of several current vacancies in the various fields are given opposite.

Any suitably qualified engineers wishing to take advantage of these opportunities, are invited to send details of their qualifications, experience and ambitions to:

The Director,
Group Personnel Services,
English Electric Company Limited,
English Electric House,
Strand,
London W.C.2,

quoting Reference No. ET 397W.

APPLICATION ENGINEERS required with relay and contactor experience applied to low-voltage A.C. motor control centres. Applicants with a wide experience of industrial applications will be able to extend their interests to the field of static switching.

APPLICATION ENGINEERS required with experience in applying variable speed A.C. and D.C. drives to industrial applications. Applicants with experience in conventional control schemes will have the opportunity to expand their knowledge of the latest techniques of control circuitry used in static power sources.

TECHNICAL SALES ENGINEERS are required to join the expanding Sales Organisation. Applicants should be of Grad. I.E.E. standard, and have knowledge of A.C. and D.C. machine characteristics and associated control techniques.

A DEVELOPMENT ENGINEER is required for the Development Section, to be responsible for the design of liquid resistances and high and low voltage mining control gear. Suitable candidates could well be found in mechanical design draughtsmen experienced in the design of liquid controllers and other mining control gear, whose qualifications and experience merit promotion to a development engineering post. (S 155)

PROFESSIONAL ENGINEERS
and an
ASSISTANT DESIGN ENGINEER

required for the
CULHAM LABORATORY, ABINGDON, BERKS.
now under construction for the
UNITED KINGDOM ATOMIC ENERGY AUTHORITY

to prepare specifications with drawings of laboratory and office buildings, and equipment and services required for thermonuclear research. Work involves liaison with scientific and technical staff to determine requirements, inspection of site construction and on the spot acceptance testing of installations.

Applicants should have served a recognised engineering apprenticeship or have had equivalent training and for the engineer posts should be Corporate members of a Senior Engineering Institution or have equivalent qualifications; for the Assistant Design Engineer post, H.N.C. and several years' drawing office experience required.

Experience of the following required:
Design, installation and maintenance of recently installed HV and MV distribution networks, including control, instrumentation and protective gear and power lighting, and heating installations, including ventilation equipment, water treatment plant and compressed air and gas supplies.

SALARY: ENGINEERS, £860 (at age 25)—£1,340 p.a. or £1,370/£1,825 according to experience;
ASSISTANT DESIGN ENGINEER, £930/£1,340 p.a.

Housing and superannuation scheme.

Send POST CARD for details to Personnel Manager (CAP/13/01/49), U.K.A.E.A., A.E.R.E., Harwell, Didcot, Berks.
(S 163)

POLYPHASE ELECTRICITY METER TESTERS. Also young men with electrical experience as trainees. Modern factory conditions. Please inquire: Personnel Manager, Landis and Gyr Ltd., Victoria Rd, North Acton, W.3. (Acorn 2282.)
(S 115)

PIRELLI-GENERAL CABLE WORKS LTD. require ENGINEERS and ASSISTANT ENGINEERS for work on overhead transmission lines in various parts of the country. Write giving full particulars of experience, age and salary expected to the Manager, Overhead Lines Department, Eastleigh, Hants. (S 180)

ASSISTANT ELECTRICAL ENGINEER

in Consulting Engineer's London office. Design supervision of electrical installations in schools, hospitals, factories, etc. Five-day week. Superannuation. Salary range £800/£1,000 p.a.

Apply in writing:
R. W. GREGORY AND PARTNERS,
21 Bloomsbury Way, W.C.1.
(S 103)

PROJECT EPOCH

Electrical Power Across the Continents

Nash and Thompson Ltd.,

A Member of Thorn Electrical Industries, Group of Companies.

have been commissioned to develop, design and manufacture a large simulator for the study of high power, high voltage direct current power distribution.

The proposed simulator will be the most complete exercise of its kind in Europe and will enable studies to be carried out on the economic linkage of large A.C. supply systems.

This unique instrument will enable systems to be modelled and predictions to be made on methods of controlling and dispatching large levels of electrical power over vast distances.

If you are interested in being in on the "ground floor" of this project, write:
Chief of Research, Nash and Thompson Ltd., Hook Rise, Tolworth, Surbiton, Surrey,

or call for

Informal Discussion

with our Chief of Research, at the following times and places:

Nash and Thompson Ltd. (as above)
Monday, 3 October, 10 a.m. to 5 p.m.
" " " 6 p.m. to 8 p.m.
Monday, 10 October, 10 a.m. to 5 p.m.
" " " 6 p.m. to 8 p.m.

or

Thorn House, Upper St. Martin's Lane, W.C.2
Saturday, 1 October, 10 a.m. to 12 noon
" 8 " " " " "

We are continually expanding and are always glad to hear from physicists, chemists and electronic engineers interested in joining a growing Company. (S 176)

SMALL West End builder seeks ELECTRICIAN wishing to start own business to take over jobbing electrical work, or might suit someone seeking part-time business.—Box No. 8019, Electrical Times. (S 201)

SENIOR DRAUGHTSMEN required preferably with experience in outdoor airbreak switchgear. Men with good mechanical experience considered. Good conditions. Pension scheme. Full details to Line Equipment Ltd., Bridgend, Glam. (S 199)

TECHNICAL SALES ENGINEER

required with experience of electrical heating and including underfloor heating, flow boilers, and electrode boilers, for Sheffield area. Generous salary and commission with car and expenses. Full details to Thermoduct Ltd., Leeds 29315. (S 157)

TECHNICAL ASSISTANT required for drafting of Electrical Regulations, Codes of Practice, etc. Graduate I.E.E. or corresponding qualification necessary, also experience in committee work and drafting of reports. Commencing salary of the order of £1,000, plus or minus an amount to be determined according to age, qualifications and experience. Progressive post. Pension scheme.—Box No. 8015, Electrical Times. (S 198)

Excellent opportunity for an EXPERIENCED ENGINEER

capable of taking charge of underground cable and overhead line contracts with a well-known progressive firm, used to working independently and controlling labour. Good salary and prospects. Superannuation scheme. Write in confidence giving age and full particulars of past experience to Box No. 8017, Electrical Times. (S 200)

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ADVERTISER seeks post with electrical firm, southern area. 30 years' electrical experience of all types of installations, measuring, ordering, records and office experience.—Box No. 8023, Electrical Times. (S 203)

MANAGER in complete charge of Electrical Contracting Business with turnover of £80,000, seeks similar post in S.W. London area.—Box No. 8021, Electrical Times. (S 202)

YOUNG MAN, O.N.C. (ELECT.), continuing studies, experienced control gear, D.O. test, etc., seeks interesting post with scope for experience and advancement. Lab, D.O. sales, etc., considered. Salary: £850. London Area.—Box No. 8007, Electrical Times. (S 139)

AGENCIES

CABLE TRUNKING. — First-class product but highly competitive and recently introduced. We require direct sellers and Commission Agents seeking an additional line, who already have contacts and regularly call on Electrical Contractors, Electricity Boards, Local Councils, Architects, Consultants and other users.—Craval Ltd., Faraday Way, St. Mary Cray, Orpington, Kent. (S 195)

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WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper Ltd., 17 Brady St, Bethnal Green, E.1. (S 1)

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A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi 5105, 7 Rothschild Rd, W.4. (S 3)

A.C. and D.C. SLOTMETERS: Time Switches and Quarterly Meters. Single and polyphase, 2½—100 amps. Tested and guaranteed 2 years. Television and Billiards Meters. — Tradex Meter Co., Surbiton, Elmbridge 2234/5/6. (S 9)

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E.MI. 200-watt amplifier. High and low impedance inputs. Output impedance 50 ohms. Rack mounted. In perfect working condition. £55.—Phone ACOrn 2380. (S 205)

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FOR SALE. — 12 RPH PAXMAN DIESEL ENGINE with Generating Set.—B.G. Plant (Sales Agency) Ltd., Watlington 44, Oxon. (S 204)

HOUSE-SERVICE METERS, A.C. or D.C., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (S 5)

HOUSE-SERVICE METERS, all types can be obtained by return from Selectrics, Dept., E.T., Meter Hse, Factory Row, Castle Circus, Torquay. Phone 7218. (S 8)

IF you require d.c. current at 30 kV to 40 kV please note: For Sale Ferranti Oil Cooled TRANSFORMER RECTIFIER, input 400/1/50, output 20 kV to 40 kV at 375 mA, complete with controls and instruments, suitable for electrostatic precipitation, etc. Unused, low price.—L. Solloman Ltd., Beaufort St, Manchester 3. Phone: BLAckfriars 4571. (S 20)

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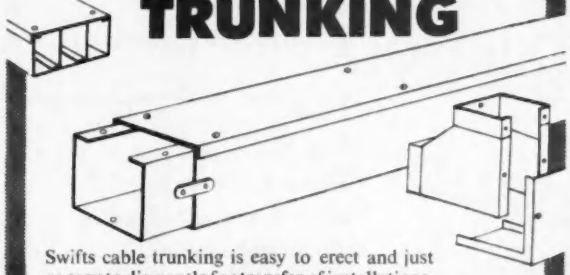

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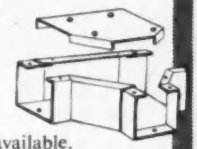

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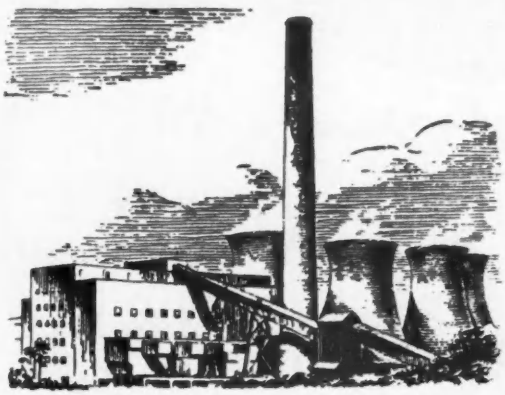
Dept. 35, Olympia Works, Durham Street, Scarborough. Tel: 1616/7 Grams: Industry.



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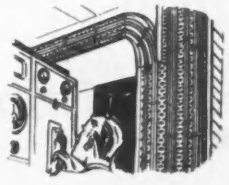

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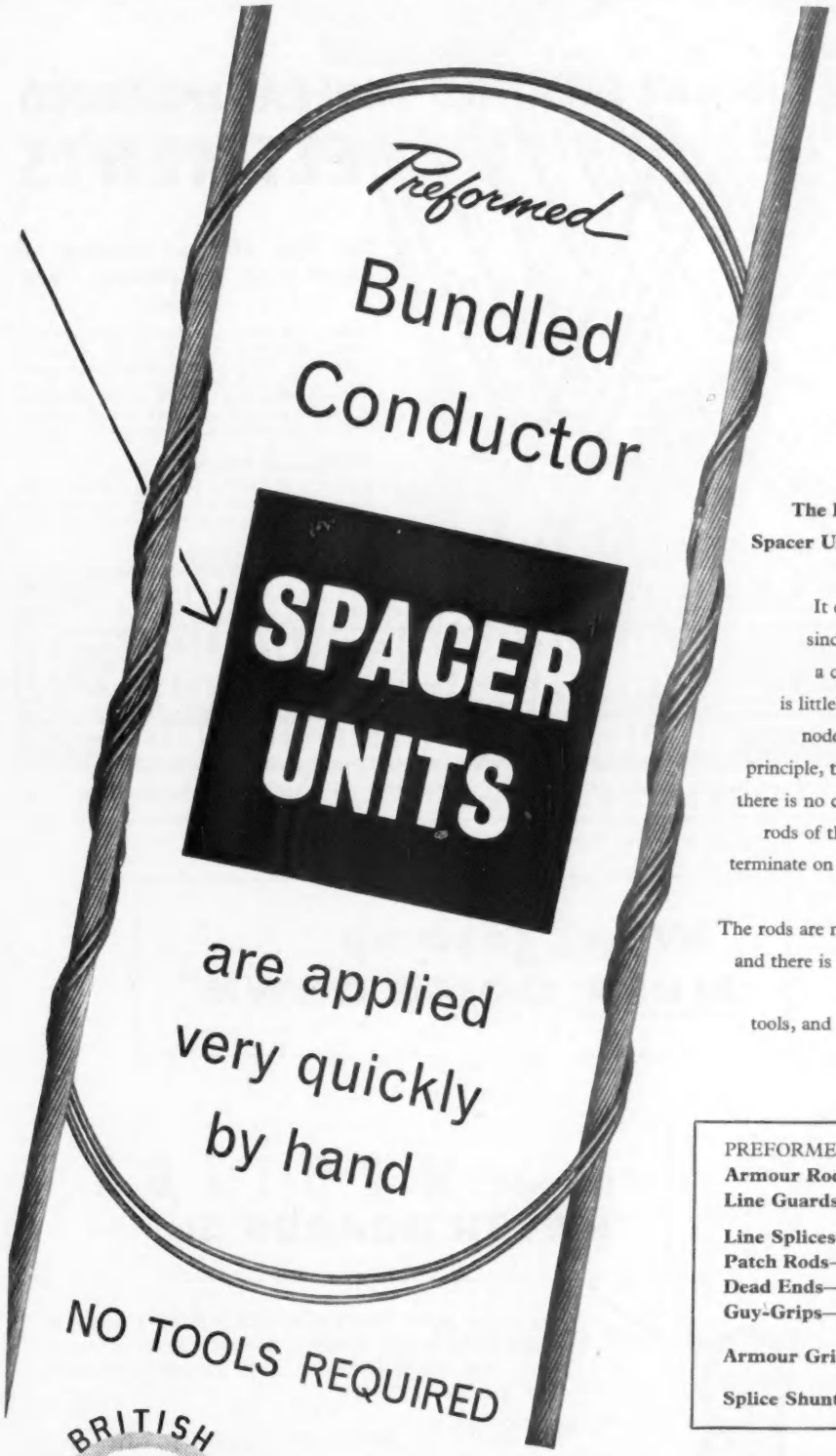

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AP 20

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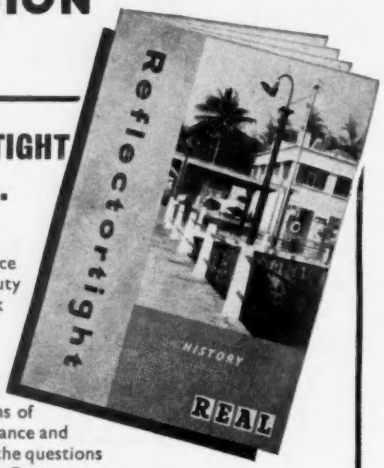

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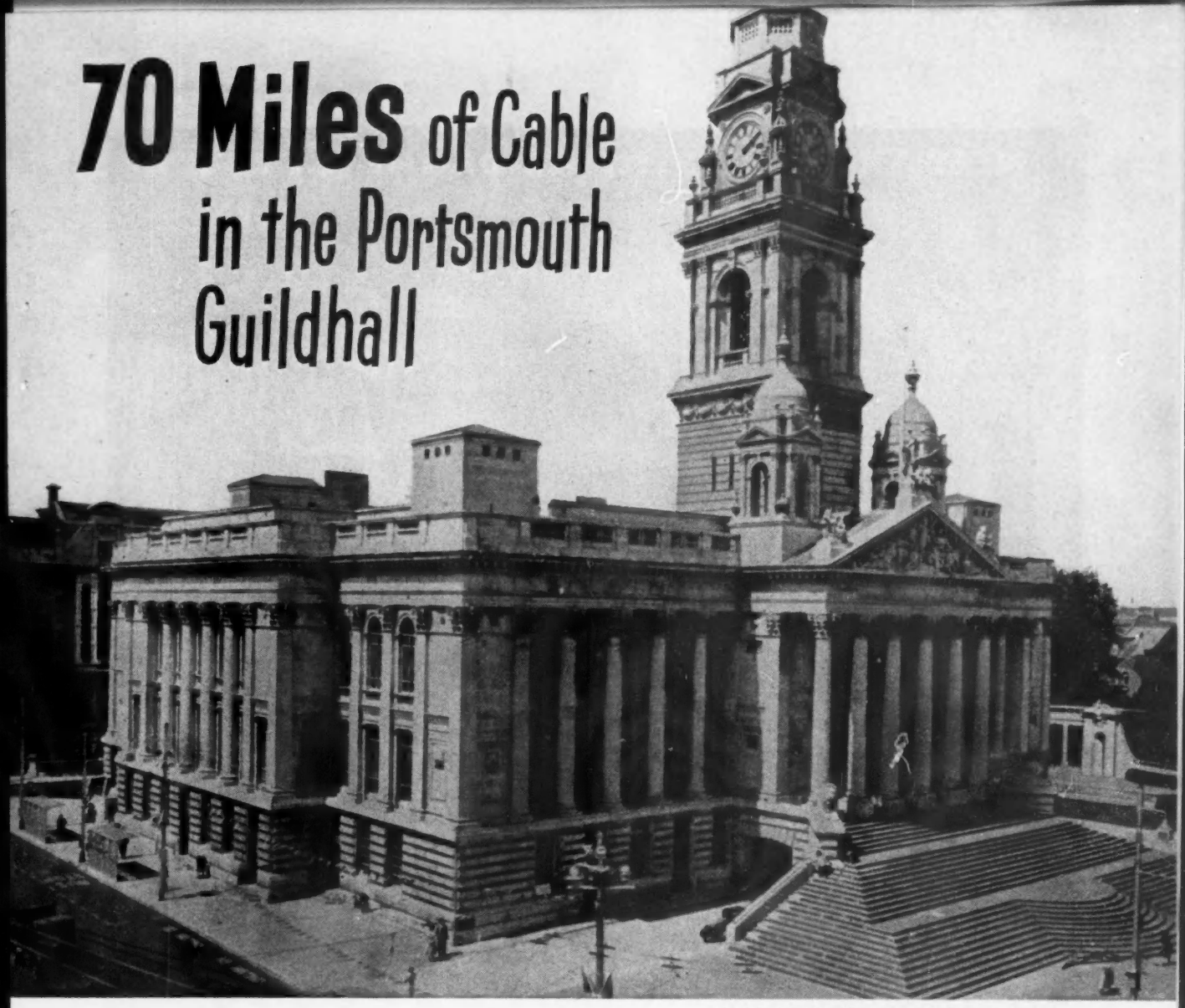
70 Miles of Cable in the Portsmouth Guildhall



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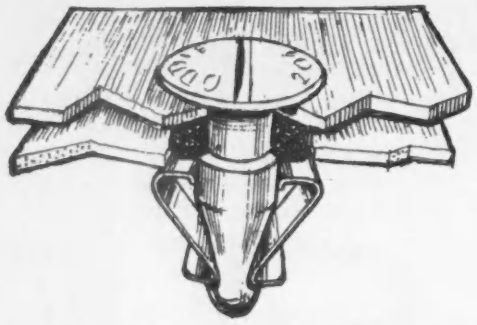

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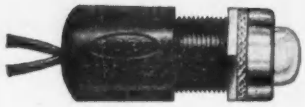

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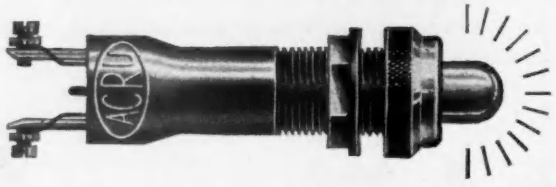

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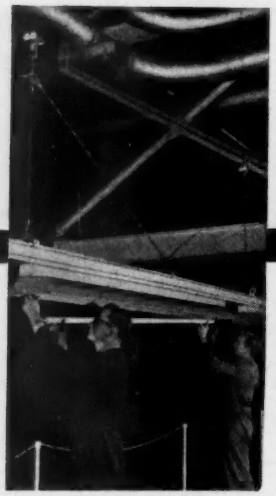

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Above: L.E.F. Gear is installed in the Boiler House at Vauxhall Motors, Luton, to facilitate maintenance of Fluorescent trunking.
Left: Modular lighting in the new library at Sheffield University is serviced by means of specially designed L.E.F. Gear.

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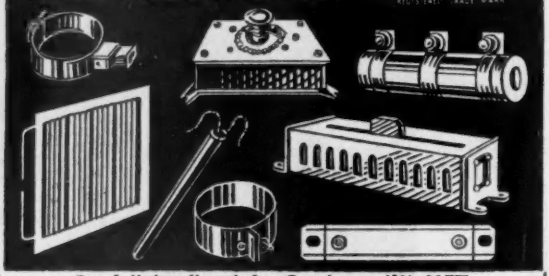

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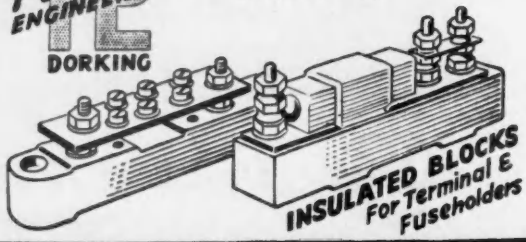

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Aeroflex Information Sheet

NON-DETERIORATING

energy limiting rewireable cartridge FUSE-LINKS

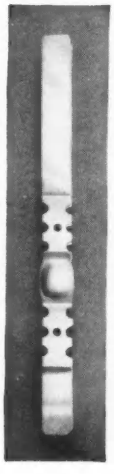
High Breaking Capacity (440 AC5)
1·25 Fusing Factor (Class P.)

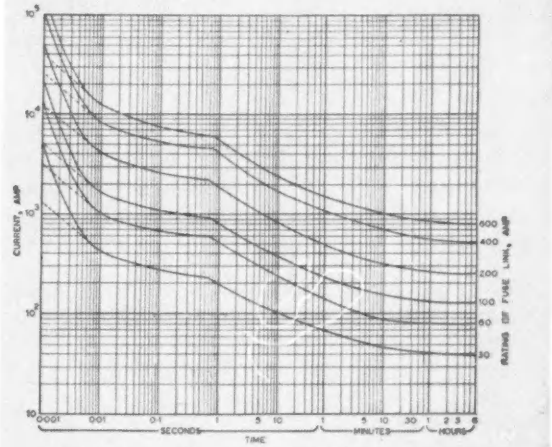
All good high breaking capacity fuses are non-deteriorating, in the sense that they will carry their full load current indefinitely, without ageing or changing of time/current characteristic but Aeroflex Energy Limiting Class P Fuses transcend this performance, because:—

(a) they are intended for use in direct-on started motor circuits and they have been rigorously tested to ensure that they will withstand repeated current surges of magnitudes up to 6 or 7 times full load current, without any increase of resistance or change of time/current characteristic, and:—

(b) they are intended for close protection of the circuits in which they are used (1·25 fusing factor). They have been rigorously tested to ensure that they will carry currents up to 95% of their minimum fusing current, without any change of resistance or any alteration of the time/current characteristic.

(Right) The standard type of Aeroflex fuse element.





Time/current characteristics of these dual-element fuse links.
———— Pre-arcing time on symmetrical a.c. fault.
- - - - - - Virtual pre-arcing time.

Parmiter Hope & Sugden Ltd.

FLUVENT ELECTRICAL WORKS · LONGSIGHT · MANCHESTER 12

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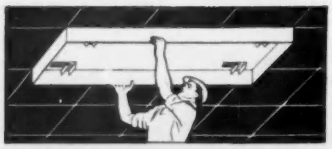
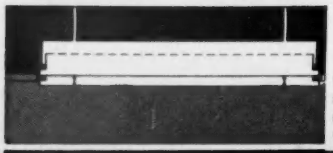
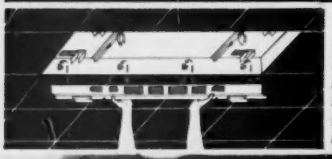


lateral adjustment using special slotted plates allows pre-wiring of ceiling



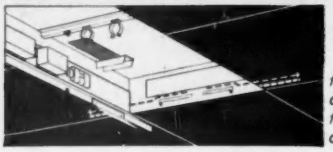
vertical adjustment of slim 1" trim ensures perfect joint with ceiling

new modular troffers streamline **false ceiling lighting** installation



control gear trays attached **after** *installation allowing single-handed fitting – hinged for easy maintenance*

atlas modulite



fits all types of ceiling and suspends from either true or false ceiling

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